Welding Engineer

50 CENTS

MAY, 1960

GAS WELDING and CUTTING

its past. . .
present . .
and future

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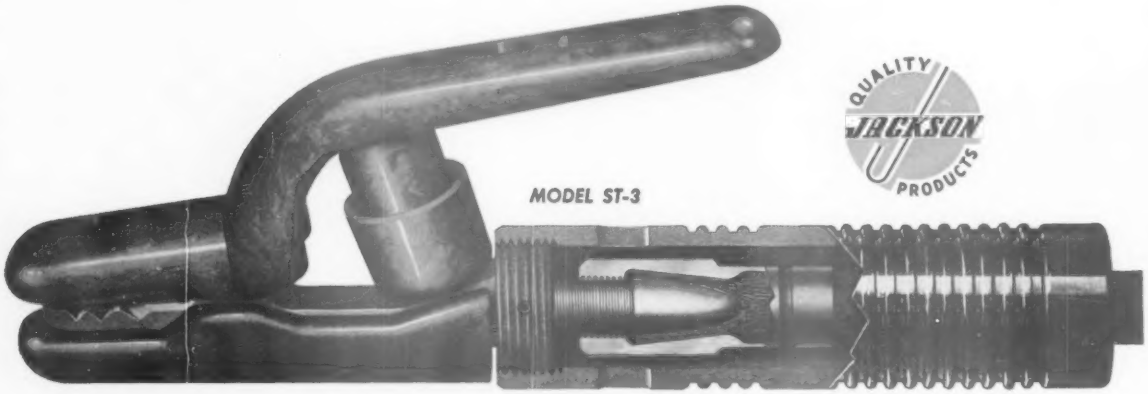


new . . .
Sealed Tight

JACKSON SERIES ST electrode holders offer a *Sealed Tight* mechanical cable connection that gives you practically one-piece conductivity between cable and holder. Tongs are of heat-treated 98% copper alloy.

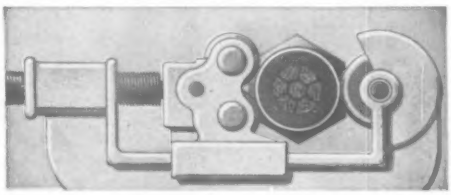
The stripped cable strands are completely *Sealed Tight* within a *connection nut*, making all-around *tight* metal-to-metal contact with the holder tong, *sealed* against moisture and dirt. The cable jacket is also *Sealed Tight*. The connection nut, by providing an all-around *tight* support of the cable jacket, allows no strain on the cable strands which usually occurs through flexure and tension.

This cable connection is quick and lasting, requiring no maintenance during the normal life of copper or aluminum cable.

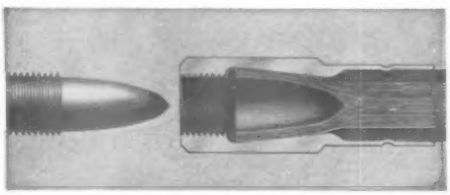
Large, ventilated handle threads onto a non-conductive asbestos bushing, has no direct metal contact with tong or cable connection, resulting in an extremely cool working holder. Should the "stinger end" of the holder require service of any kind, it may be quickly replaced without disturbing the actual cable connection. This important feature greatly reduces holder down-time and effects savings in cable cost.

Copper alloy lower jaw terminates in a point, silver-plated for greatest conductivity. When nut is tightened, cable strands are equally disposed around this point, *Sealed Tight*.

The nut extends backward, forming a ferrule around the cable jacket. This *Sealed Tight Connection Nut* is made in sizes to fit cables No. 1, 1/0, 2/0, and 3/0.



For a *truly permanent nut-to-cable connection*, the ferrule of the nut is crimped around the cable jacket, using Jackson's inexpensive, fast-acting crimping tool.



Detachable Stinger feature enables the operator to detach the "stinger end" by unscrewing it from the connection nut. The cable strands stay in place inside the nut.

Sold Everywhere by Better Welding Supply Dealers

MADE IN TWO SIZES . . .

Model ST-3, "Sealed Tight" Insulated Copper Alloy Holder Electrodes through ¼" • 300 Amps • 10" long

Model ST-5, "Sealed Tight" Insulated Copper Alloy Holder Electrodes through ⅜" • 500 Amps • 11½" long

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

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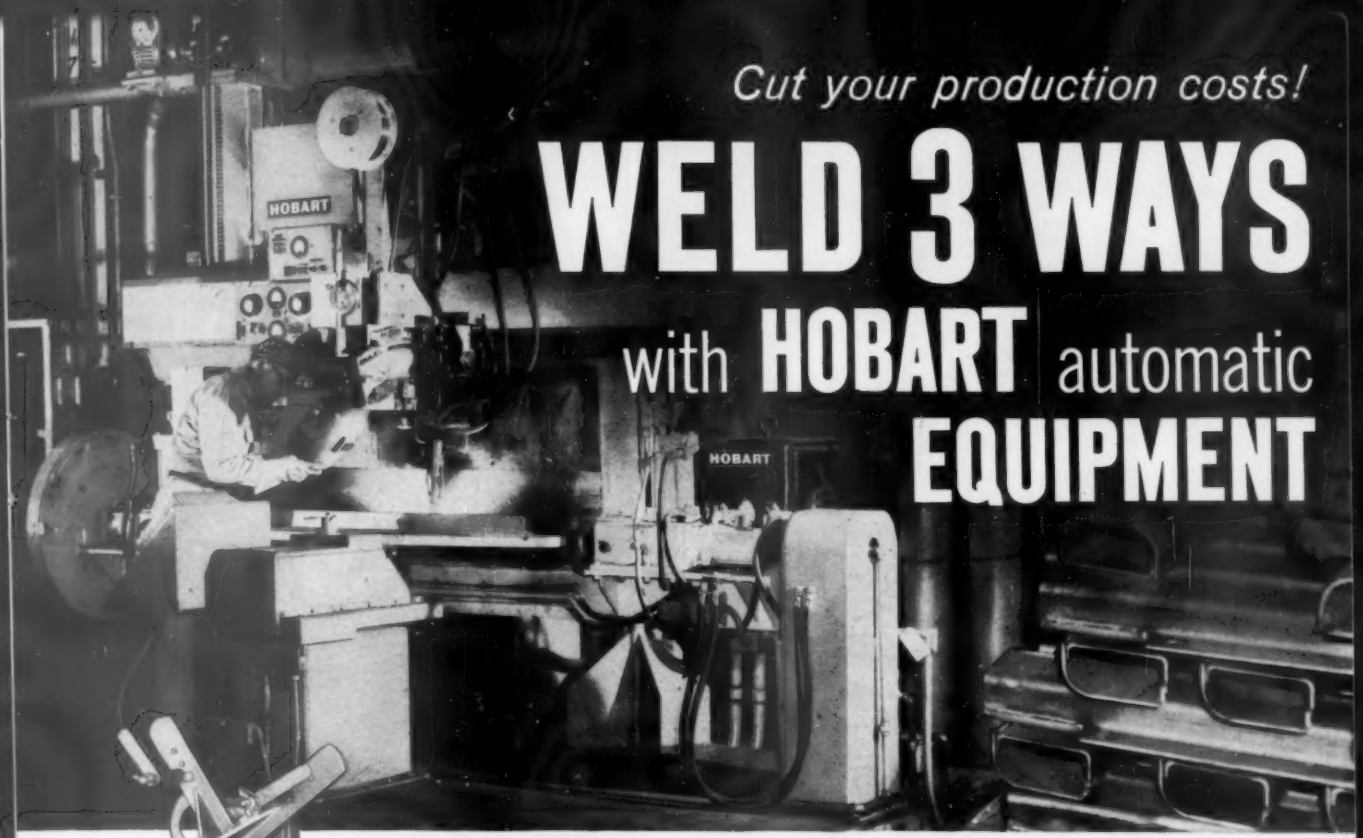
WELD 3 WAYS with HOBART automatic EQUIPMENT



SO VERSATILE you can use it for—

1. **INERT GAS** The basic unit welds aluminum, stainless, monel, inconel, steel and other metals.
2. **CARBON DIOXIDE (CO_2)** Just change to waterless side delivery nozzle (at left) for welding steel and some alloys.
3. **SUBMERGED ARC** Add this flux hopper for welding steel and alloys.

Select your welding process by simply switching components. Choose the method most suitable for your production schedule. Results are amazing. Welds are uniform time after time, and there's no need to use highly skilled operators.

No. 2 CO_2 Nozzle and No. 3 Flux Hopper are optional components at slight extra cost.

HOBART BROTHERS CO., BOX U-50, TROY, O. Phone FE 2-1223, *"Manufacturers of the world's most complete line of arc welding equipment."*

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It pays to use equipment that's easy to adapt to your particular work. Hobart's automatic equipment "package" is the finest available: A constant voltage welding machine and power source. Automatic wire-feeder and controls. Complete accessories. Automatic welding wires and submerged arc fluxes.

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☐ I'd like to know more about Hobart's new versatile automatic welding equipment. I'm particularly interested in: ☐ Inert Gas Welding ☐ CO_2 Welding ☐ Submerged Arc Welding ☐ Automatic Wire ☐ Submerged Arc Flux.

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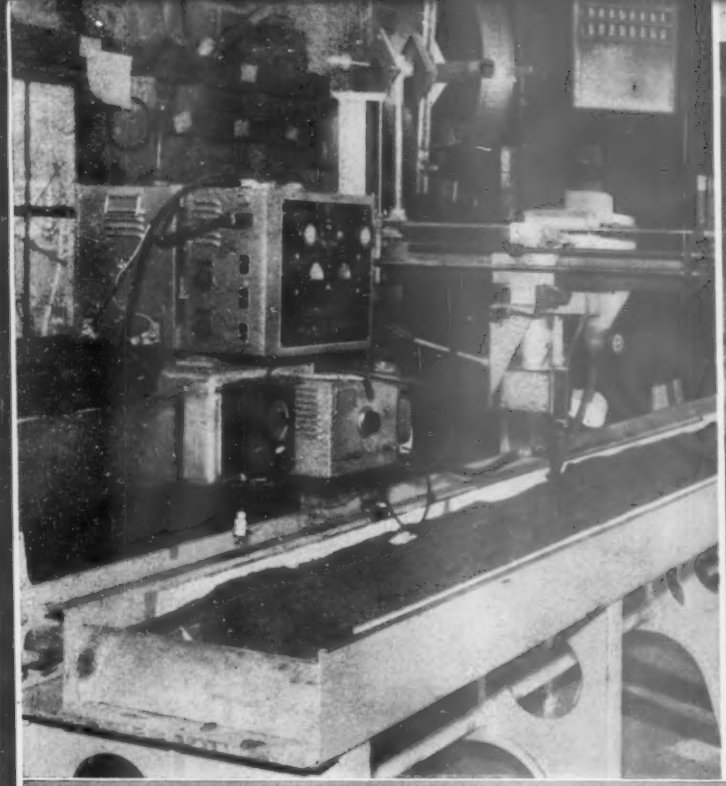

HARDSURFACING TRACTOR TRACKS using Hobart H-950 Flux.

HOBART H-950 FLUX used in rebuilding and hardsurfacing tractor rollers and other circular parts.

ANNOUNCING
the new H-950 FLUX

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This Inert Flux will not complicate the metallurgy or hardness of weld deposits when using an alloying wire.

The Hobart H-950 Flux has been tested extensively and approved by one of the country's large hardsurfacing wire producers. They state without reservation that this flux will work with any of their hardsurfacing wires.

The "self-peeling" characteristics of this new pelletized flux are also appealing and desired for high speed production.

Think what it would mean to be able to standardize on ONE FLUX for ALL your hardsurfacing applications. Make your own test. See the difference in Hobart's H-950 as compared with ordinary flux.

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☐ Yes, I'd like to give your new H-950 Flux a test on our work, without obligation.

Also interested in ☐ H-100 ☐ H-400 Flux.

*Our work is*_____

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Would like information on your latest ☐ Fully automatic ☐ Semi-automatic Arc Welders.

AUTOFLUX H-100. Ideal for single pass fabrication. Has excellent characteristics for butt and lap welds on steels in gage and light plate thickness.

AUTOFLUX H-400. A proven product for fabrication on single or multi-pass work. Fast production can be attained because of this flux's ability to sustain high travel speed with X-ray quality deposits.

HOBART WELDERS • ELECTRODES

VOL. 45—No. 5

The magazine of joining and severing of materials

Welding Engineer

This is welding: May, 1960

For the four-color illustration on this month's cover, we are indebted to Bethlehem Steel Co., which provided us with negatives.

Gas welding and cutting

. . . its past

. . . present

. . . future

The 60th year of the gas welding torch 33
In 1900 the first oxyacetylene torch as we know it was developed by French scientist Edmon Fouche. Six decades later its future is still bright, according to *WE* statistics and a survey of top management men in the gas and gas-apparatus field.

Fundamentals of oxyacetylene welding 38
A return to the basics of this gas welding process should bring to mind various forgotten techniques—as well as some which were never used previously.
★ (For a reprint of this article, circle number 250.)

Annual IAA convention meets in San Francisco 41
Technical sessions at this 62nd convention will deal with safety, acetylene uses, and cryogenics. Highlight of the meeting will be the awarding of the 34th Morehead Medal, to be given this year to Dr. Charles G. Keel, of Basel, Switzerland.

Better oxygen cutting with magnified template drawings 42
A look into the near future of oxygen cutting by author **Richard L. Deily** shows many changes are in store for the shipbuilding industry—as well as all industries making use of this modern means of severing metals.

Mig welded aluminum cones house missile systems 44
Hundreds of little-known systems and components make their contributions in getting one of Uncle Sam's "birds" off the ground, in this case, an optical system. Welding, of course, plays its usual important role in this phase of the space age.

Also in this issue:

Photoelectric control aids weld uniformity 46
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Alloy Rods Company is truly the leader in the alloy welding industry, and we suggest that you consult us regarding iron powder low hydrogen electrodes ranging in tensile properties from 70,000 p.s.i. to 120,000 p.s.i. and Charpy impact values from 240 ft. lbs. at room temperature to 15 ft. lbs. at —150° F. Specify your requirements from the following:

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Welding Engineer

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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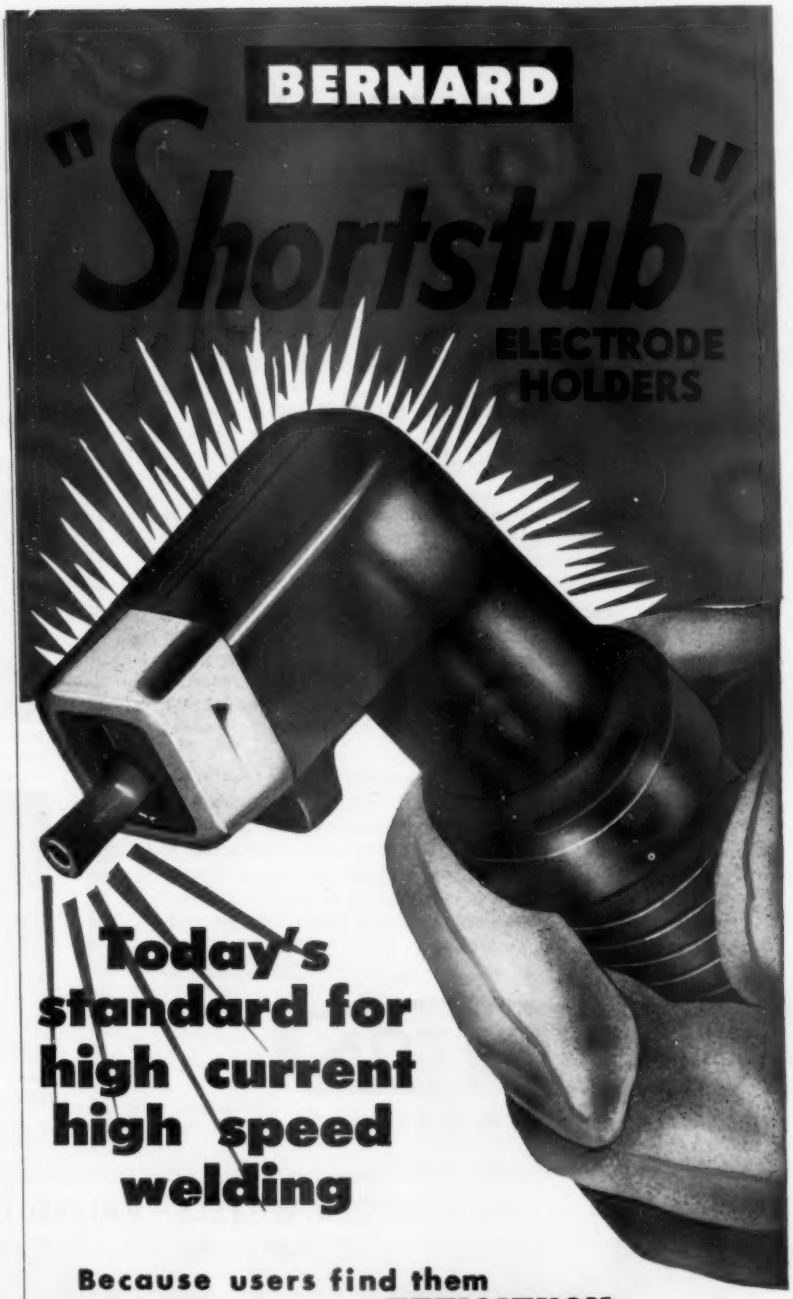

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Do EVERY grinding job better

From lightest to heaviest work, Norton wheels bring you profit-boosting performance

Norton portable wheels include all standard types, as well as the increasingly popular reinforced types. All are engineered for maximum strength, safety and versatility. All are built to *hug that work*, with less vibration and bounce.

In straight, cup and cone types you can get 44 ALUNDUM abrasive and the B-11 resinoid bond. "44" is non-premium priced, cutting faster, grinding cooler and lasting longer than similarly priced aluminum oxide abrasives. B-11 resinoid wheels are more uniform in structure, better balanced, made to closest duplication and available in half-grade increments across the entire hardness scale.*

Among the various Norton reinforced wheels, the rigid Type BDA and semi-flexible Type BFR are an unbeatable team for usefulness. Separately, each handles many grinding jobs. Together, they cover an almost endless list of applications.

Ask your Norton Distributor how these fast, tough wheels can benefit every grinding job you do. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

STRAIGHT–CUP–CONE WHEELS

Straight Wheel makes short work of smoothing a heavy weld.

Flaring Cup Wheel (available with built-in reinforcement in size 6/4¾" x 2") saves time and work on many welds.

Cone Wheel is easier to use in hard-to-reach spots like this.

REINFORCED WHEELS – RAISED HUB

The Rigid Type is ideal for heavier weld grinding, smoothing flame-cut edges, slotting, notching, cutting-off, etc. Reinforced with glass cloth and Nylon.

The Semi-Flexible Type excels in light weld grinding, removing scale, blending contours, scarfing and beveling before welding. Reinforced with cotton fabric and Nylon.

W-1947

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NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

SIGNING contract for new rail welding plant under construction by Linde Co., New York City, are officials of Linde and the Pennsylvania Railroad, which will use the finished rail. Located at Harrisburg, Pa., the plant will serve eastern and southeastern roads. Seated are (from left) J. B. Jones, vice president, purchasing and real estate, Pennsylvania RR; W. S. Winn, manager, Oxweld railroad department, Linde Co. Standing are (from left) C. J. Henry, chief engineer for Pennsylvania, and W. G. Gumm, manager of engineering of Linde's Oxweld department.

NEWS

Harris opens firm in Mexico

A new firm, Harris de Mexico, S. A., has been formed to manufacture and distribute all major products of the Harris Calorific Co., Cleveland, in Mexico.

The firm's general offices and manufacturing facilities in Mexico City will cover 20,000 sq ft of floor space.

Officers of the company are Stevenson M. Taylor, president; David Champion, vice president; and Victor M. Hernandez, general manager.

Metal exposition will spotlight steel

The steel industry will be spotlighted at the 1960 Metal Show, to be held the week of Oct. 17 at the Philadelphia Trade and Convention Center.

Exhibitors and visitors from 11 metal areas of industry have been invited to the 42nd annual congress. Technical sessions of the ASM will place broad emphasis on the engineering aspects of metals, with meetings scheduled for the Bellevue-Stratford Hotel and at the exposition hall itself.

Heavy attendance seen for Metals Congress

Heavy attendance appears assured for the 2nd Southwestern Metal Congress and Exposition, to be held May 9-13 at Dallas, according to A. R. Putnam, managing director of the American Society for Metals.

The congress, which will take place in the Sheraton-Dallas Hotel, and the exposition, scheduled for Texas State Fair Park, will each feature the latest advances in metals technology. Programs and displays will be designed to serve the aircraft, space vehicle, rocket, missile, electronics, instrument, chemical, and petroleum industries.

Technical topics to be presented include: steels for high load applications; new frontiers in welding and brazing; composite materials for high temperature applications; new metal forming techniques; heat treatment of problem materials; failure analysis and testing at high temperatures.

Also, developments in carbon dioxide welding processes; brazed honeycomb for high temperatures; pipeline welding; magnetic field sensing for testing instrumentation and control applications; advantages and limitations of thermographic inspection of brazed honeycomb and similar structures.

Among firms exhibiting at the congress will be the following: American Pullmax Co., Inc., Budd Co., Contour Marker Corp., Eutectic Welding Alloys Corp., Kester Solder Co., Lennox Tool & Machine Builders, Magnaflux Corp., Ohio Nut & Bolt Co., Picker X-Ray Corp., Sperry Products, Inc., Curtiss-Wright Corp.

A. O. Smith completes foreign agreements

A. O. Smith International S. A., which handles the foreign business of A. O. Smith Corp., Milwaukee, has completed two new licensing agreements and established a European subsidiary.

AOS A. G., the subsidiary, has been set up in Zug, Switzerland to handle licensing agreements and other contractural relationships between the Smith International and manufacturing companies in Europe and the Middle East.

AOS has completed an agreement with Ruhrstahl A. G., of Hattingen, West Germany, whereby the German concern will make and sell Smith capital goods equipment for the oil and petro-chemical industries. Ruhrstahl is a steel fabricating company making pressure vessels, heat exchangers, railroad equipment, and large forgings, castings, and welded structures.

In addition, Smith signed an agreement with Casya, Buenos Aires, covering the manufacture and sale in Argentina of Smith-Erie dispensing pumps.

SUBMARINE periscope rests in improved shipping container made by The Baltimore Steel Co., Baltimore. Fabricated from 6061-T6 aluminum alloy sheet supplied by Kaiser Aluminum & Chemical Sales, Inc., the package is said to save 700 lb in weight. Welding on the units is done by the Tig process, using 5356 alloy wire.

AEC to hold seminar on non-destructive testing

The Atomic Energy Commission will conduct an unclassified symposium on non-destructive testing of reactor materials at the Commission's headquarters at Germantown, Md., May 20.

Purpose of the symposium is to acquaint industry representatives with equipment and techniques used in non-destructive testing done by the Commission.

Welded flasks provide push for Polaris

A battery of welded steel flasks will provide the huge blast for the U. S. Navy's first undersea battleship when it joins the fleet sometime next fall.

The flasks, fabricated from heat-treated, high-tensile steel at Lukens Steel Co., Coatesville, Pa., are built to withstand a pressure of 7,000 psi. Filled with compressed air, they serve as the boost that pops the Polaris up through the water to the surface, where the missile's own engines take over.

Polaris is scheduled to go to sea aboard the George Washington, and will have an initial range of 1,000-1,200 miles.

Design conference to stress home, factory products

Application of space age design theory and techniques to new products for the home and factory will be the subject of the four-day Design Engineering Conference in New York City.

The conference, which will be held concurrently with the Design Engineering Show, May 23 through 26 at the New York Coliseum, will consider advances made in power, control, materials, computers, components and mechanics to determine how everyday products may be improved.

Sponsored by the machine design division of the American Society of Mechanical Engineers, the show is expected to draw more than 20,000 engineers and executives. More than 400 companies will exhibit at the conference, which will occupy all four floors of the Coliseum.

Linde to erect new flame-plating plant

Linde Co., Division of Union Carbide Corp., New York City, will build a new plant at North Haven, Conn., devoted to flame-plating processes.

This will be Linde's third flame-plating facility; others are located at Indianapolis and Los Angeles.

Completion of the facility is scheduled for December, with ground breaking anticipated this month.

Attitudes affect safety record, says expert

Many industrial accidents may be caused before a new employee even goes to work. This is the opinion of an industrial relations expert who spoke before the annual convention of the Greater New York Safety Council late in March.

What the expert, Charles J. Rienzo, of Revere Copper & Brass Inc., Rome, N. Y., meant was that the seeds of many accidents lay in hiring employees who lack proper safety attitudes. He said inadequate instruction and indoctrination in safety procedures was another important factor.

Rienzi stated that job applicants at Revere are given safety booklets and are tested on the contents.

Norton movie tells story of abrasives

"Old as the Hills" is the title of a new motion picture produced by Norton Co., Worcester, Mass., to tell the story of abrasion and its role in modern industry.

Starting with abrasive action in a primitive setting, the film traces man's progress through the centuries in adapting abrasives to his use. The 16-mm sound film is designed primarily for showings at schools, social organizations, and employee groups.

COMING EVENTS

MAY 5-7: NWSA 16th Annual National Convention, Palmer House, Chicago.

MAY 9-10: Annual Convention International Acetylene Assn., St. Francis Hotel, San Francisco.

MAY 9-13: 2nd Southwestern Metal Exposition and Congress, Sheraton-Dallas Hotel, Dallas.

MAY 25-26: Symposium on Refractory Metals and Alloys, McGregor Center, Wayne University, Detroit.

OCT. 13-15: AWS Western Welding Show, Exposition Hall, Santa Clara County Fair Ground, San Jose, Calif.

OCT. 17-21: 48th Annual Safety Congress, Chicago; 1960 Philadelphia Metal Show, Trade and Convention Center, Philadelphia.

DEC. 5-8: 1st Biennial Short Course on Welding Engineering, University of Illinois, Urbana, Ill.

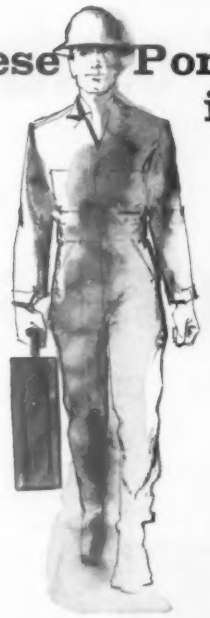
Chicago firm to hold equipment exhibit

Fred Peters Welding Supply Co., Chicago, will hold an exhibit open to the public at the Internation Ampitheater May 17-19.

The show includes continuous live demonstrations of hand and automatic welding, Mig spot welding, machine cutting, hard surfacing, and other oxyacetylene and electric arc welding processes.

Agents of companies represented by Peters will be present to provide information.

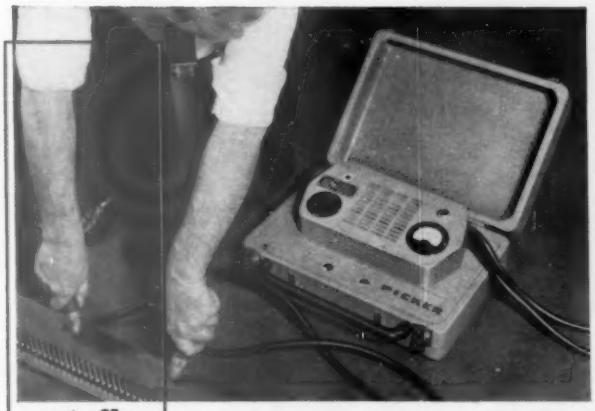
ON display at recent small industries exhibit at New Dehli, India, was this welder manufactured by Lincoln Electric Co., Cleveland. Welding is becoming an increasingly important factor in India's steel-scarce economy. The exhibit was sponsored by the U. S. Department of Commerce.



these Portable Units bring magnetic particle inspection wherever needed . . . *in shop, in field*

Between them, this brace of magnetic particle units can solve many an inspection problem—maybe even one that's troubling you right now. Each, within its compass, has a capability approaching that of "big" machines. Each is light enough for one man to carry to the job. Each is self-contained: works efficiently off any 110 volt AC line. PORTAFLUX shines at some kinds of inspection jobs, FERROFLUX excels at others . . . depends on circumstances.

Talk it over with your local Picker man. He'll be glad to examine your situation, offer expert counsel and recommendations. (That holds for many other non-destructive inspection methods, too: he has a lot of them in his bag. The listing below suggests some of the ways in which Picker may serve you).



portaflux induces a magnetic field in the inspected object by passing a 500 ampere AC current through it. Provides *longitudinal* or *circular* magnetization with coil or prod technics to handle a wide variety of parts. The whole works—generator, control, prods and cable, pack up in a rugged aluminum case: total weight, ready to go, is only 60 lbs. Great for shop, aircraft, automotive maintenance inspection. Inspection of tools and dies, for fatigue cracks, etc. Inspection of turbine parts, small shafts, etc. in power plants. All this for only $500.00 complete (*price slightly higher in West*).

ferroflux is a powerful electromagnet which produces a magnetic flux in the area of the inspected part straddled by the magnetic poles. (Optionally available is a Variac voltage regulator for reducing or increasing flux.) Specially good for detecting subsurface defects because magnetic flux permeates object. No possibility of arc-damaging surface because no current passes through object. An excellent unit for inspecting welds in pipelines and pressure vessels and for detecting heat-treating and grinding cracks. Weight 30 lbs. All this for only $415.00. Variac voltage regulator $97.50 extra (*price slightly higher in West*).

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x-radiography	**ANDREX** portable x-ray units-140 KV, 160 KV, 200 KV, 260 KV **PICKER** x-ray units—35 KV Beryllium window, 90 KV, 110KV, 150 KV (stationary and mobile), 270 KV portable
gamma radiography	**PICKER** *Pipeliner*—30 curies, Ir^{192}, *Cyclops*—1500 curies; Co^{60} **TECH/OPS** Iridium^{192} units from 10 to 100 curies; Cobalt^{60} 3 to 100 curies: also Thulium^{170}, Cesium^{137}
fluoroscopy	**PICKER** Image Intensifier and associated equipment
magnetic particle	**PICKER** *Ferroscope* *Ferroflux* *Portaflux* **PIXmag** Ferropowders and pastes
dye penetrant	**PIXchek** Penetrants, Cleaners, Developers, and accessories

Picker x-ray

PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

Monautronic V-2 welding control certifies weld quality... cuts rejects and production costs

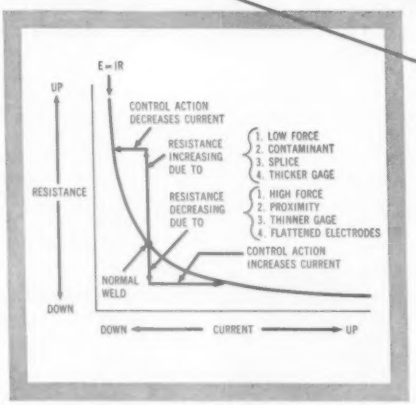
A resistance welding control that automatically compensates for every process variable

The new Monautronic V-2 welding control introduces the concept of feedback control to produce spot-welds of consistently high quality. It makes use of the latest advances in electronic computing to overcome automatically such obstacles to weld quality as line voltage fluctuation, electrode wear, variations in electrode tip force, surface finish and shunting.

The Monautronic V-2 compensates for undesirable variations usually encountered in resistance welding by maintaining voltage across a weld at a constant value. This constraint of voltage amounts to constraint of final weld temperatures, and such temperature control assures production of quality welds.

- **Automatic lockout**—occurs when process variations are so severe that the available current range would not cover the requirements for quality welding. The control detects extreme contamination, failure in the force system, overwelding, poor matching or fitup, and any other conditions that would result in substandard welds.
- **Automatic sequencing**—all provisions for single spot, roll spot or seam welding. Sequencing is 100% accurate, and exceeds NEMA standard specification 3B. Special sequence programming is available.
- **Transistorized design**—for high reliability, compactness, low power consumption.
- **Modular construction**—permits easy removal of the three modules and separate firing unit, simplifies maintenance.
- **Shock and vibration resistant construction**—for long, reliable service in even the most demanding applications.
- **Safety interlock**—for protection of personnel during tip dressing.
- **Tamperproof case**—prevents access to control by unauthorized personnel.

SEQUENCE MODULE—Utilizes digital pulse-type circuitry . . . provides 100% accuracy.
HEAT CONTROL MODULE—Contains automatic and manual heat controls plus lockout devices. Processes input information from weld.
POWER SUPPLY MODULE—Power supply plus required auxiliary safety features.
FIRING MODULE—Provides large currents needed to fire ignitrons. Supplied as separate module.



VOLTAGE CONSTRAINT

Graph shows how voltage control compensates for process variations. Any point on curved line E = IR represents a specific voltage. With normal weld as reference point, certain process variations cause increased resistance, while others cause a decrease. Control action is achieved through change of current to constrain voltage to same level for every weld.

for complete details contact: THE BUDD COMPANY
Electronic Controls Section • Philadelphia 32, Pa.

ELECTRONIC Budd CONTROLS

WELDING ENGINEER

Your May, 1960 *Weld World*

As WE went to press, these were the industry's latest developments:

. . First billion-dollar year in history was recorded by welding industry in 1959. Research Dept. of Welding Engineer Publications reports total sales of $1,067,608,833, which includes $672 million in oxygen and acetylene. Gas apparatus and accessory sales hit $64 million to give that section of the industry sales of almost $737 million. Arc welding's share of the billion-plus market was $270.7 million, while resistance welding's was almost $60 million. Complete report will be published next month.

. . Victor Equipment Co., San Francisco, has acquired L & B Welding Equipment, Inc., Berkeley, Calif. The latter will operate as wholly owned Victor subsidiary and will continue under direction of present executives. About 18,000 shares of Victor stock is the reported purchase price.

. . Metrol, Inc., Pasadena, Calif., manufacturer of electromagnetic non-destructive testing equipment, has been purchased by Budd Co. Metrol will become part of Budd's Instruments Division and will, for the present, continue to operate in California.

. . Another transaction involving two firms in the same field saw Peterson Machine Tool, Inc., Merriam, Kan., producer of magnetic-particle inspection equipment, become part of Sperry Products Co., Danbury, Conn. Sperry, a division of Howe Sound Co., also has lines of ultrasonic and X-ray apparatus--the latter only recently acquired through Howe's purchase of Triplett and Barton, Inc., Burbank, Calif.

. . Earlier predictions for a near-boom year are now being tempered with caution. But resistance-welding industry continues to bounce back. Resistance Welder Manufacturers Association reports $3,750,000 in new orders for a recent month--tops for the past three years for its member firms.

. . Steel mills are cutting back production to well below capacity. With inventories seemingly rebuilt sooner than expected, demand has fallen off to point where one producer, heretofore operating at 96% capacity, will drop down below 80%.

. . Russians claim rivet welding with coated electrodes economically joins structural plates. Similar to plug welding as we know it, the Soviet method differs in that a copper dam helps shape a rivet-like head at top of weld.

. . National Electronics, Inc., and Industrial Tubes, Inc., both of Geneva, Ill., have consolidated and will operate under the former's name.

Letters . . .

Artificial prices?

Sir: *Canoga Park, Calif.*

Your editorial in the March issue of WE seems to strike at the very foundation of American free enterprise. You relate the case of an electrode manufacturer ceasing production of electrodes after 30 years in the business because of a small loss incurred on every pound of electrodes manufactured.

Is this not as it should be? Are we, the users of welding products expected to support an obviously inefficient manufacturer who cannot compete on the open market? Certainly not! Similar situations occur every day, and will continue to occur as long as we have the liberty to compete in a free market. Your example is a simple case of "survival of the fittest."

It is safe to assume that the manufacturer cited did not make any real contributions to the welding industry or he failed to properly promote them. More likely, however, his methods of manufacturing, selling and distribution were not competitive . . .

Those manufacturers who complain the loudest about lack of profit in the welding electrode business choose to ignore the fact that their product is regularly being sold below list price; the same price they claim is unrealistic.

Frankly, as a user, I do not believe I could trust these manufacturers with a built-in 50% profit. They would surely squander it and attempt to gain additional business by cutting prices, lavish entertainment of potential customers, and every other way possible . . . except producing a better product at a lower cost for the user.

I am sure that manufacturers, in a competitive market, will continue to exert every effort to develop an improved product simply to capture a greater portion of the market, which in turn will provide that company with a greater profit; the greatest incentive and motivating force in American industry today.

Let us beware of a situation, similar to socialism, which guarantees the manufacturer a profit, regardless of efficiency and in general eliminates the desire or necessity of product improvement.

C. S. Shira

Sir: *Cleveland*

You have inferred that electrode prices should be increased to support more research and prevent business casualties. Both of these objectives are certainly desirable but I am not sure that higher electrode prices are desirable or would necessarily achieve either objective.

Our concern with prices is not whether they are set relatively too high or too low, but rather that they are honestly established in conformance with a basic policy objective.

Our policy is to price electrodes on what it costs us to manufacture and distribute them, including the cost of research and development. We do not base prices on what the traffic will bear in order to maximize profits. As costs go up or down, we adjust prices accordingly. Our objective is to continually reduce costs and prices to make welding increasingly more economical, more competitive, and to continuously expand the welding industry.

In spite of the fact that the price level of the steel wire from which electrodes are made has increased approximately 300% over the past 25 years, the price of arc welding

The Most Advanced Line of Welding Aids Ever Produced for

PIPE-LAYOUTS of ANY Type or Location

CURV-O-MARK

CONTOUR MARKERS

Marks off any pipe joint or structural angle cut accurately, easily and without figuring cutbacks. Marks all around pipe—saves time and gas. Available in 2 sizes of 1½" to 18" in cross-section, 16" to 48" diam.

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Really, 5 tools in one—it replaces Protractor, Centering Head, Center Punch, Level and Scale. Eliminates difficult measuring, checking and marking. Pocket size—weight only 9 ozs.

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For Aligning Slip-on, Top Joint, Stub End and Welding Neck Flanges. This self-centering Tool is quickly adjustable for all types of Flanges or Pipe sizes from 3" to 12" in diameter.

CURV-O-MARK

Ang-Lo-Cator Protractor

An easy way to find accurate angles on pipe and structural material. A valuable aid to weldors, structural workers and pipe fitters. Size 4" x 8"

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CONTOUR SALES CORPORATION

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* Short Arc * Submerged Arc
* Magnetic Flux

Glenn Constant Voltage Power Supply with Stepless Vernier Slope Control

Never underestimate the importance of the power supply to the proper operation of today's improved welding processes.

Weld quality, appearance, speed and economy all depend on matching arc characteristics to the requirements of the process and the material. If your power supply can't produce the required characteristics, you're sure to lose some or all of the performance you want.

Glenn Pacific, working closely with major welding process development engineers, has kept pace with process requirements. For example, GLENN constant voltage power supplies with linear slope control have solved major problems in MIG and Short Arc welding on aluminum and ferrous alloys, and many exotic "space age" metals.

Get the facts *now* about GLENN Power Supplies matched to your welding needs—you'll be hours and dollars ahead! For details, please address Dept. 137.

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to meet AWS-ASTM specifications

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Packaged for easy handling and stocking

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Low-fuming, high-strength, high nickel rod for joining and overlay with the oxy-acetylene process. Bonds readily to copper-, iron-, and nickel-base metals and alloys.

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Low-fuming, manganese bronze rod with nickel added for higher strength and ductility. For brazing and braze-welding high-strength bronzes and brasses, steel, cast iron, and malleable iron with the oxy-acetylene process.

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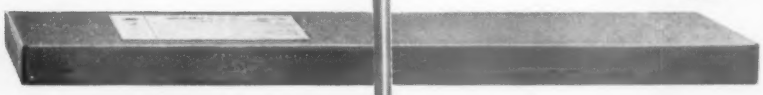
Low-fuming, high-strength, manganese bronze rod for brazing and braze-welding steel, cast iron, malleable iron, and copper and its alloys with the oxy-acetylene process.

AMPCO-BRāZ FLUX No. 2

Saves time on general welding, cast-iron welding, and brazing. Has many other advantages.



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electrodes generally is only 45% higher.

C. G. Herbruck
Lincoln Electric Co.

Chain cutting

Sir: *Johannesburg, South Africa*

We were particularly interested to see, in the January, 1960, issue of *WE*, the picture at the bottom of page 8 showing Lt. Gov. John N. Dempsey of Connecticut cutting a chain with a torch.

We are enclosing a picture which you will admit looks, at first glance, almost identical with the

one you produced and which depicts the president of the Port Elizabeth Chamber of Commerce officially opening our company's showroom at our branch in this seaport.

On the left of P. H. Mosenthal — president of the Chamber — is our district manager, Mr. Bawden, and on the right our managing director, J. B. Sutherland.

Noel A. Beal
African Oxygen Ltd.

Work scheduling

Sir: *Vallejo, Calif.*

In the March *WE*, I noted with great interest the article on page 31 titled "and the system that makes it work."

My position at the shipyard is senior analyst and scheduler, Shop 26, welding department, and the system shown appears very similar to the one that would apply in my line of work. I would appreciate receiving more information on this system . . .

W. H. Watson
Mare Island Naval Shipyard
—For further information write Ray Mount, The Jeffrey Mfg. Co., East First Ave., Columbus 16, Ohio.

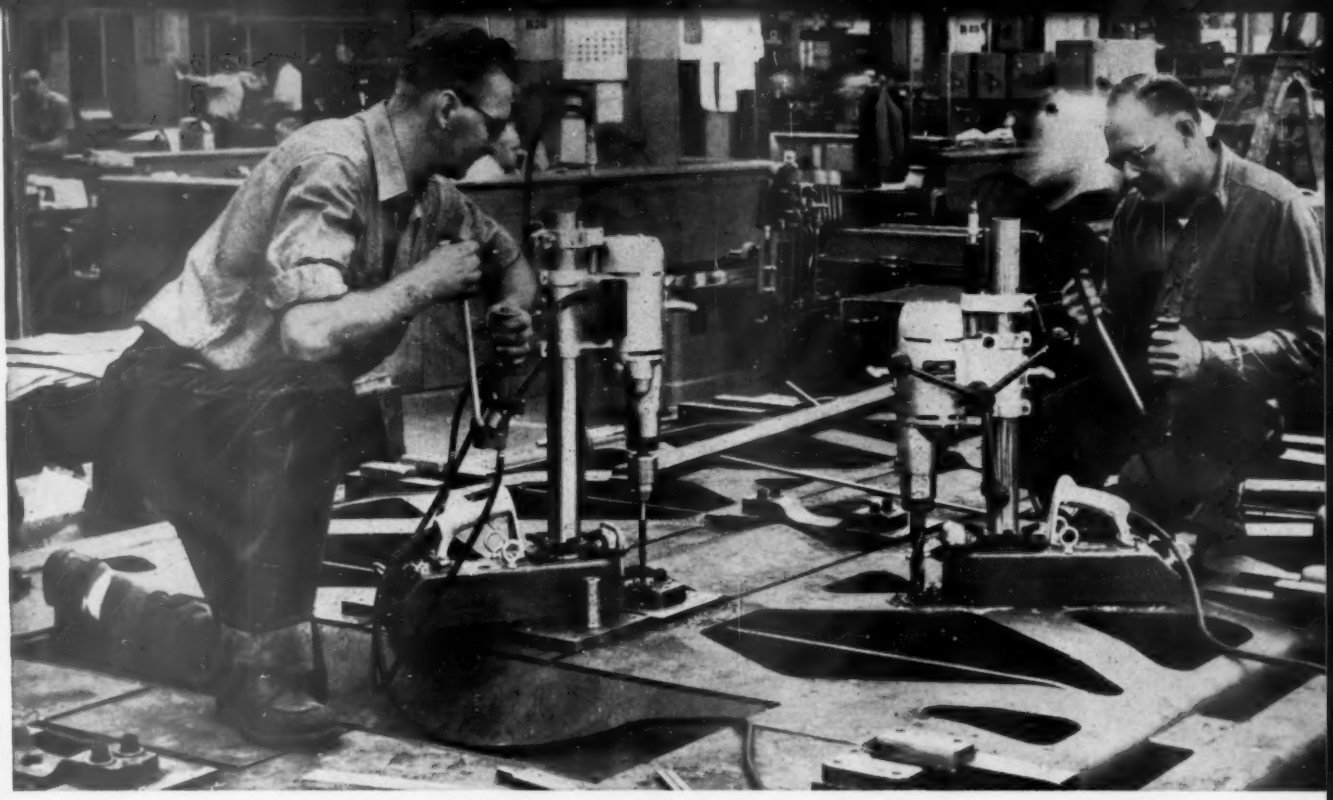
Reprinted editorial

Sir: *Pittsburgh, Pa.*

Enclosed are two copies of the February issue of the Pitt-Des Moines News. This issue carries your editorial, "183 Years of 'Progress,'" from your July, 1959, WE.

We want to thank you again for your kind permission to print this editorial in our paper.

William H. Ferguson
Pittsburgh-DesMoines Steel Co.



Norton saves 3 days' production time with B&D Magnetic Drill Press!

6 four-hour setups eliminated in drilling 384 holes!

You'll find Black & Decker Magnetic Drill Presses in the oddest places—sideways, upside down, against the ceiling, and here, in the middle of a job that was too big to handle with a radial drill.

The Grinding Machine Division of Norton Company, Worcester, Mass., saved three full days of production time—and plenty of manpower—by using a Black & Decker 1¼" Magnetic Drill Press to accurately drill, tap and countersink this 25,000 pound weldment.

If Norton's experience gives you some idea of the ways your company could use B&D Magnetic Drill Presses (¾" and 1¼" capacities), why not mail the coupon for a free demonstration. Or call your nearby B&D distributor.

50th YEAR

Leading Distributors Everywhere Sell

See Tools-Electric -Yellow Pages- for Service & Sales

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QUALITY ELECTRIC TOOLS

B&D MAGNETIC DRILL PRESSES work high overhead upside down; enable maintenance man to get into tight spots easily, rapidly.

POWER FEED CONTROL is standard on both the ¾" and 1¼" models. Both are easily transportable, simple to put to work, then move to the next job.

THE BLACK & DECKER MFG. CO., Dept. 3405
Towson 4, Maryland, (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of B&D Magnetic Drill Press

☐ Please send additional information on_____

Name_____ Title_____

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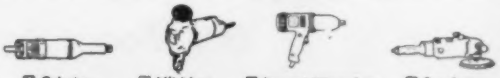
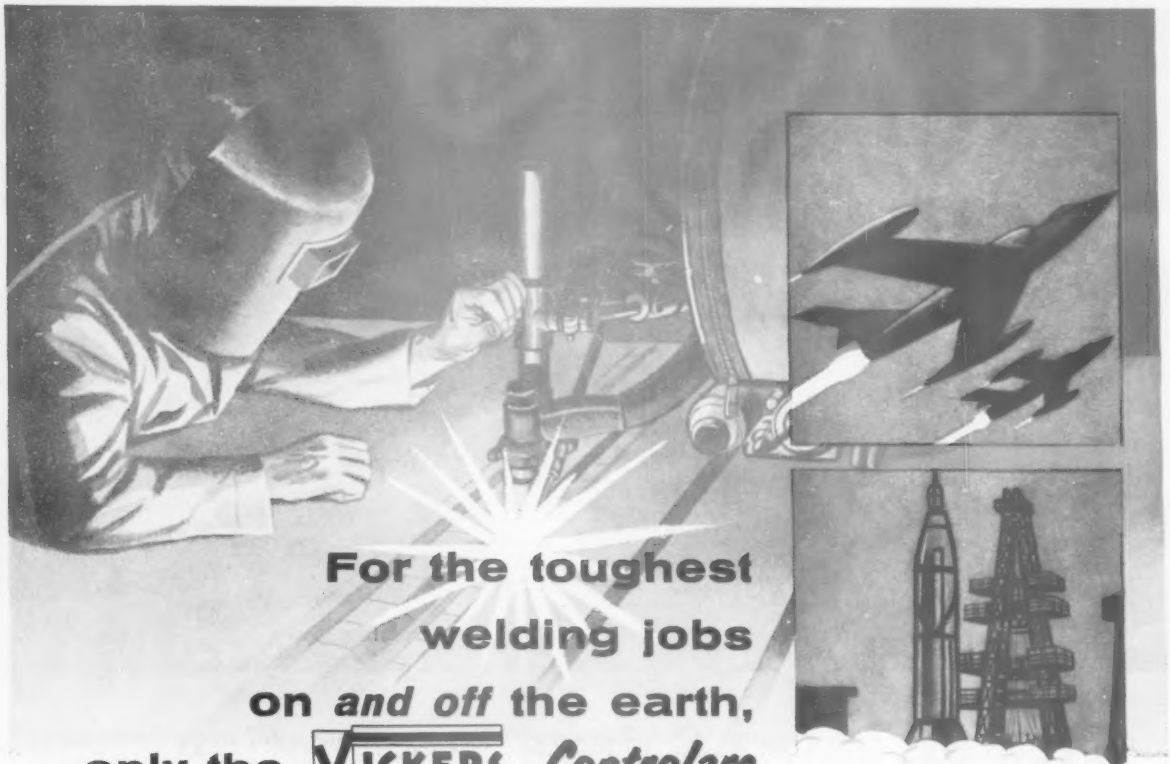
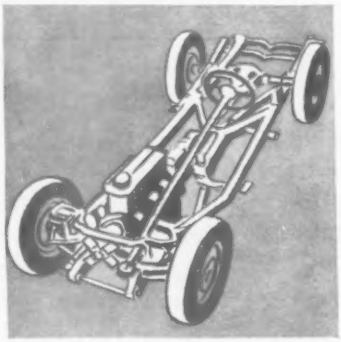


☐ Grinders ☐ Nibblers ☐ Impact Wrenches ☐ Sanders



For the toughest welding jobs on *and off* the earth, only the VICKERS® *Controlarc*® will do!



In this age of supersonic aircraft, long range missiles, nuclear seagoing vessels and atomic power stations, the need for quality welding is greater than ever before.

The Vickers CONTROLARC DC Welder was designed to satisfy the incredibly stringent demands of challenging projects which often involve new metals and alloys, extremes in wall thicknesses, higher pressures and temperatures, uncompromising dimensional tolerances.

Only a welder of the versatility, close control and dependability of an M/A CONTROLARC can meet the requirements of these critical welding jobs. The Vickers CONTROLARC with accessories combines several welding functions in a single machine: standard metallic arc, constant potential, tungsten inert gas. It can be operated by remote control, if desired. It reduces the chance of human error by *automatically* controlling the current and type of arc, through the entire welding range, under all welding conditions.

Complete information on this remarkable machine is contained in Bulletin EPD 7116-1. Write today—on your letterhead.

Only CONTROLARCS Can Provide Line Voltage Compensation

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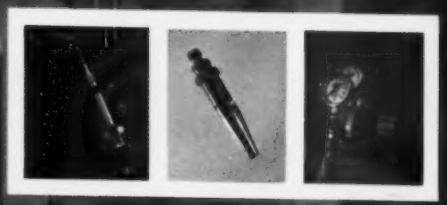
Move up to
Airco Quality

Industry's Top Line
Welding and Cutting Torches, Tips and Regulators



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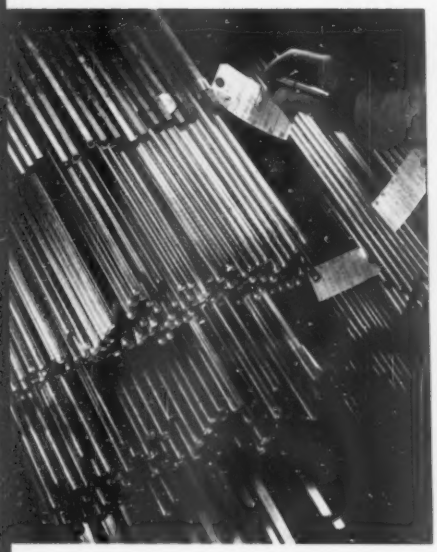
Quality in Design
Quality in Manufacture
Quality in Service



△ Quality starts with raw materials—this gleaming stock of copper and brass is used in the manufacture of Airco welding and cutting torches, tips and regulators.

△ The royal blue flames of automatic gas brazing make strong, smooth, uniform joints in Airco torches. This machine brazes parts in brass, bronze, copper and stainless steel.

△ A test of quality, in capable hands: every torch must prove its capacity, gas tightness and proper operation before it can bear the AIRCO trademark.

△ Costly special machines flawlessly drill tip orifices 0.025" in diameter—one more quality step in manufacturing Airco Cutting Torch Tips.

△ Tips must test out at top quality, also—every one is tested separately for accuracy of hole alignment and stability of gas flow.

Whatever your welding and cutting needs—whether they call for high **precision** or high **production,** or both—you'll get the finest results with quality Airco torches, tips and regulators. These photographs, taken at the Air Reduction Equipment Manufacturing Plant, Union, N. J., help give a small idea of how quality is the keynote from start to finish in every product that's marked AIRCO.

SEE YOUR AUTHORIZED AIRCO DISTRIBUTOR

△ Precision means quality. This multi-spindle machine drills and taps precisely-angled holes in Airco product components.

△ A distinctive sheen proves quality, too. Airco takes great pains to produce top appearance as well as reliable operation in Airco Regulators.

△ Testing for gas tightness and accurate gas control— industry's highest testing standards mean Airco Regulators can be relied on for accuracy and durability.

◁ Welding and cutting tips are ultrasonically stripped of burrs, chips and oils accumulated during the manufacturing process.

Photographs: Robert Yarnall Richie

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When you buy Airco products, you've bought the finest that modern manufacturing techniques can produce. But there's more than that to **Airco quality.**

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You'll find an Air Reduction Sales Office, or an Authorized Airco Distributor in your classified telephone directory, listed under "Welding Equipment and Supplies." Use these outlets as your source, not only of welding and cutting torches, tips and regulators—but also for electrodes, arc welding machines, gas-shielded arc welding equipment, supplies and accessories and all industrial gases. For any welding or cutting need—call Airco.

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BETWEEN PASSES

Roy Poe joins WE

Roy W. Poe, former vice president and sales manager of Tweco Products, Wichita, Kan., has joined the advertising sales staff of Welding Engineer Publications, Inc. Ted B. Jefferson, publisher, said that Poe would serve both WELDING ENGINEER and THE WELDING DISTRIBUTOR as Midwest District Manager, succeeding Warren Ware who resigned.

Poe

Well known in the welding industry, Poe joined Tweco in 1946. Prior to that time, he was sales manager and personnel director for Swallow Airplane Co. He attended Wichita University.

A native of Kansas, Poe is married and has one son.

helium problem

There is no logical or strategic reason to justify continuing government monopoly in production and sale of helium gas.

This stand has been taken by the Chamber of Commerce of the United States in urging private ownership (instead of government) for 12 proposed helium extraction plants. The statement was made in a letter to a subcommittee of the House Interior and Insular Affairs Committee, which is (or was) considering bills for extraction and storage of helium from natural-gas pipelines . . . helium that would otherwise go up in smoke.

Under the bills the subcommittee was studying, private industry would not participate in the proposed conservation program.

While praising Interior for trying to conserve the millions of cubic feet of helium now wasted daily, the Chamber feels that private firms be encouraged to build the plants. It suggested that:

—The government buy and sell helium at market prices rather than at fixed (government) prices.

—Private firms be permitted to sell helium to all customers, including government agencies and defense contractors.

—The vague and unnecessary restrictions on helium extraction licenses to private industry be removed from the bills.

—The right of eminent domain over private properties for the Secretary of Interior be removed from the bills.

consideration

. . . Is all one of our readers asks—consideration for the human element as well as for the welding machine.

This reader recently wrote us about a situation at a construction site where chrome-steel welds kept cracking despite the fact the same weldor or weldors successfully joined test coupons in the shop.

His answer: "The beads cracked because the weldor was exposed to an icy wind without even a windbreak . . . when they finally brought some shop conditions out on the site, the cracking stopped."

Our correspondent points out that a man who is cold or otherwise uncomfortable can't make a top quality weld—and we concur. On the other hand, this does not mean that "shops should lay in a supply of easy chairs for the weldors," our man continues, "but a little consideration . . . certainly will pay off in the end product."

The least that can be done, opines our reader, is to keep the weldor as dry (well, almost) as the electrodes he uses.

education by industry

Another example of education within the industry was brought to light recently when your editor visited the Magnaflux Corp. plant on the far northwest side of Chicago. Touring the plant with Frank Catlin, we came across a group of men also on a plant tour, which, explained Frank, was a class starting out on a week's session on nondestructive testing.

We recognized (among others) John H. Forrer of North Dakota State College in the group. Not many days afterward, we received a letter from John, who is a lecturer in welding at the school of engineering at Fargo. Here are some of his comments:

"Everyone knows we have to have more welding education in the schools of engineering and that it must be done with help from industry. The Magnaflux Corp. recently made it possible for me to attend one of its five-day nondestructive testing courses. Personally, I have never learned so much in so short a time as I did during that week.

"R. C. Eichin, educational director, is responsible for the course, and H. E. Van Campen is the instructor . . .

"A great deal is being done in magnetic and penetrant inspection—a lot more could be accomplished if all inspectors were thoroughly trained in this field. Untrained inspectors are no better than no inspectors at all . . .

"A basic background in non-destructive testing should be a must . . . and should be included . . . in all colleges. Here at the college, we hope to have a complete lecture course ready for our senior engineering students by next fall, and we have Magnaflux to thank for it to a great degree . . . It certainly has gone a long way to train inspectors the way they should be trained."

Were there but more such firms . . .

honors

The National Ornamental Iron Manufacturers Association, at its February convention in New Orleans, honored Ted B. Jefferson, publisher of WELDING ENGINEER, for "outstanding service, loyalty and devotion in the organization, development and growth" of NOIMA. An attractive certificate of appreciation sent him now hangs in Ted's office.

Revolutionary General

has unique high peak power which resistance welding

A new type of control ignitron with coaxial design, the GL-7670, has been developed by General Electric to control high-current, short-duration power pulses utilized by a new "pulse-power" resistance welding method.

In the new General Electric ignitron, current passes down the inside of the tube from anode to cathode, then back up the wall of the tube to a *coaxial* cathode terminal at the top. This coaxial flow of current provides a magnetic *shield* to prevent the damaging arc deflection which such high peak currents could cause in standard ignitrons.

Available for immediate delivery, the new GL-7670 may be used to advantage in a number of other high peak current applications—such as capacitor discharge circuits. The new tube meets standard size "B" welder ratings, and has the same basic dimensions as the standard "B" welder ignitron. Full information from offices listed at right.

Electric Control Ignitron coaxial design. Handles is vital to radically new method.

GL-7670
Coaxial Ignitron

FEATURES

1. Cathode connection at top
2. Compact dimensions
3. Easy to mount
4. Stainless steel jacket
5. Provision for temperature control

Progress Is Our Most Important Product

GENERAL ELECTRIC

9545-8481-25

Phone your nearest General Electric Power Tube Dept. office for samples and application assistance.

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EXecutive 3-3600

RESISTANCE WELDER ANALYSIS SYSTEM

Cuts costs with fast, exact set-up and maintenance

This completely self-contained unit is ideal for checking out all types of resistance welders — in initial set-up, qualification and maintenance. It supplies ink-on-paper-tape recordings of weld current, pressure and phasing. So portable and simple it can check 20-25 welders a day. Variable recording speeds make it a valuable time study tool.

Price $2800

Includes wheeled cabinet 31" x 23" x 20" with self-contained roll-up power cord and voltage stabilizer, with space for storage of transducers and accessory cables.

Tech Data

2-Channel Oscillograph recorder; Separate Amplifiers for each function (1 Carrier Type Strain Gauge, records amplitude and duration of squeeze — forge and post heat; 1 High Gain DC records secondary current, amplitude, number of weld cycles plus 180 cycle ripple)

Variable recorder speeds of 200, 100, 50, 25, 10, and 5 mm. per sec. (Marginal time and event markers optional extra.) Pressure pick-up incorporated into horn replacing standard 1¼" or 1½" horn, or in an external case connected to lower arm of welder.

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275 MASSACHUSETTS AVE., CAMBRIDGE 39, MASS.

30 YEARS AGO

(Taken from **Welding Engineer** of May, 1930)

—30 Years Ago—

"Arc welding with safety" is the title of a paper written by C. M. Taylor, vice president of Lincoln Electric Co., Cleveland, which was published in this month's issue of "National Safety News."

—30 Years Ago—

Newly elected officers for Chicago Section, AWS, include Chairman C. B. Evans, Vice-Chairman G. T. Horton, Secretary-Treasurer M. S. Hendricks.

—30 Years Ago—

The program committee for the fall Convention of the International Acetylene Association, to be held in Chicago, consists of H. F. Bulkley (chairman), J. I. Banash, Henry Booth, H. S. Card, O. E. Engler, L. R. Gurley, H. E. Rockefeller, F. E. Rogers and H. S. Smith. Convention arrangements will be under the chairmanship of Charles Schuh. His committee members are Banash, B. N. Law, E. L. Mills and W. A. Slack.

—30 Years Ago—

The Lincoln Electric Co., Cleveland, has transferred three men from manufacturing to the welder service division. John C. Ardagh will be in Chicago; R. A. Kyle in New York; and Robert Newton in Cleveland.

—30 Years Ago—

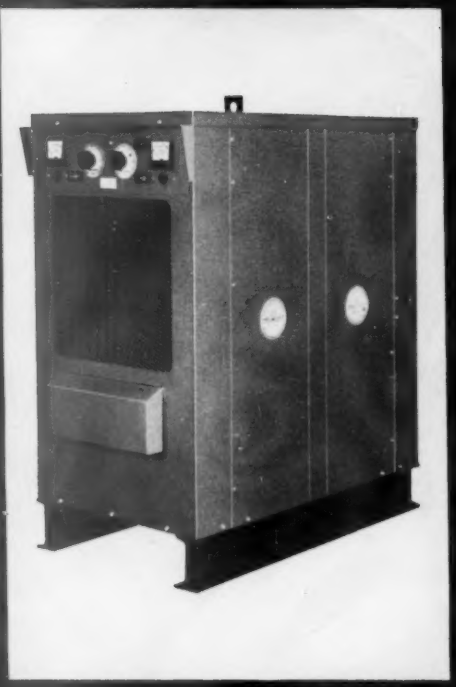
E. A. Doyle was elected president of the American Welding Society at its annual spring meeting in New York. Other officers and directors elected for the coming year were F. P. McKibben, C. W. Babcock, W. W. Barnes, H. A. Woofter, J. J. Crowe, W. H. Gibb, H. S. Smith and W. C. Swift.

—30 Years Ago—

B. M. Kimball has organized the Cylinder Gas & Welding Co. in Cleveland to deal in acetylene gas and to operate a general welding business.

—30 Years Ago—

Indiana Oxygen Co. reportedly is planning to build a new two-story plant in Indianapolis.



Model SR-1000-A1

TWO NEW ONES YOU SHOULD KNOW ABOUT

miller WELDERS

Model SR-1000 is a three-phase transformer with exclusive Miller-made completely sealed semi-metallic rectifiers. It delivers 1000 amperes of d-c at 40v on 100% duty cycle.

As a power source, the SR-1000 has won wide acceptance for Arcair processes, TIG or MIG cutting, automatic welding, submerged arc, plasma jet, melting, electric furnaces, stress relieving, and other demanding, high temperature applications.

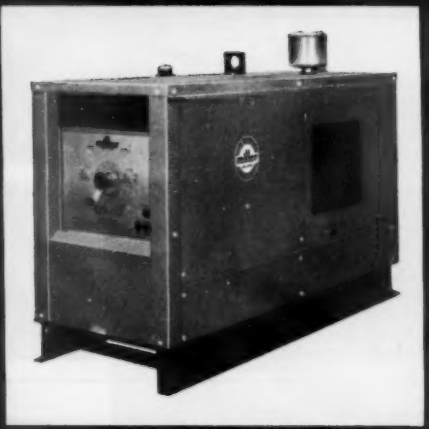
A single range output control with continuously variable rheostat may be replaced with optional remote control. Parallel or series hookups are provided for with multiple output controls available.

Advantages of the Miller SR-1000 include minimum maintenance, quiet operation, low idling input, low starting currents and marked economy.

DD-250-L Traditional Miller welder/power plant efficiency is retained in the new DD-250-L d-c welder and a-c power plant to which has been added diesel economy and safety.

Hercules 38 h.p. 3 cylinder direct injection diesel engine drives new Miller DD-250-L d-c welder/a-c power plant, which delivers:

- Two d-c welding ranges: 50-200 amperes, 150-350 amperes
- Duty Cycle: 100%
- Rated output: 250 amperes d-c at 40v, 100% duty cycle
- Maximum open circuit voltage: 65
- Current adjustment steps: infinite
- Power: 12 KW, 115-230v single phase, 60 cycle a-c. Up to 6.5 KW a-c while welding. 1 KW, 115v auxiliary d-c power while welding.



Model DD-250-L

Complete specifications on either or both of these items will be sent promptly upon request.

miller ELECTRIC MANUFACTURING COMPANY, INC. APPLETON, WISCONSIN

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- LEAK-PROOF
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AO 9706-W

Always insist on AO Trademarked Safety Products.

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COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

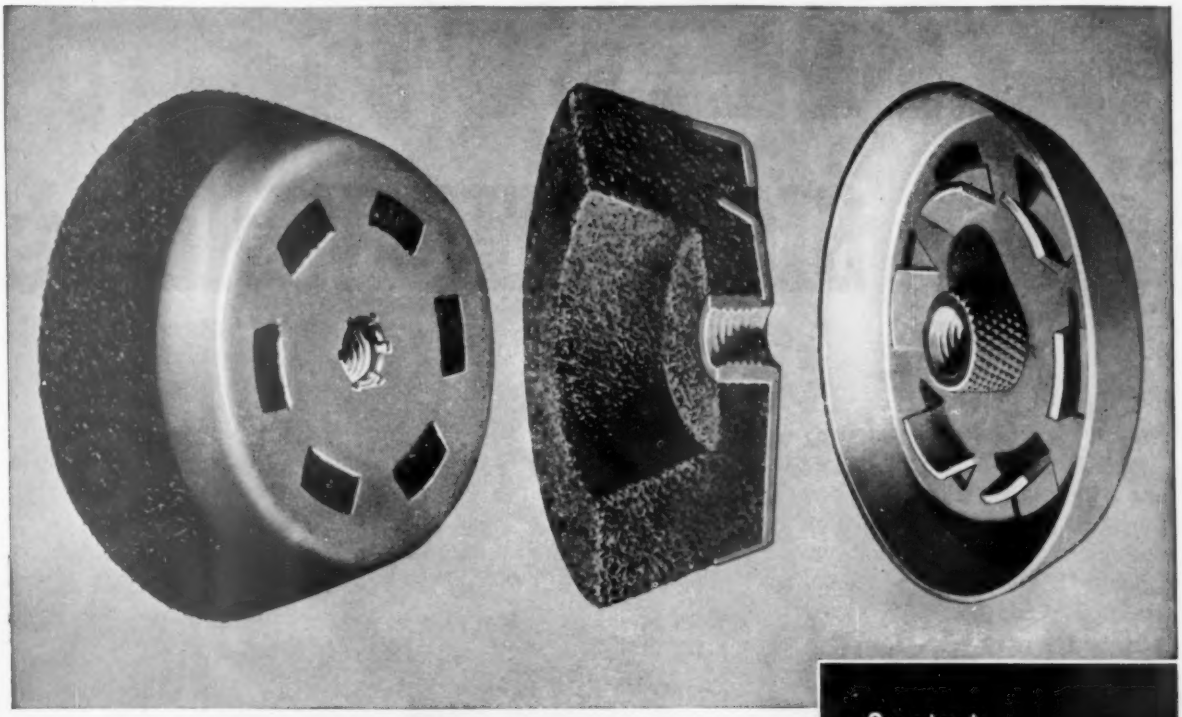
It's Here! New Miracle Inside Coating for AO "Weld-Cool" White Helmets

Quick Facts

- Model 9706-W has white exterior, curved chin aluminum glass holder, lift front. Model 9702-W same except has stationary front.
- Inside coating has non-reflective dull black surface.
- Moisture proof.
- Aluminized plastic coverplate available on request.
- Highly polished aluminum glass holder.
- Helmets are flame resistant.
- Headgear locks securely when set to desired head size.
- Adequate ventilation.
- Adjustable friction joints.
- Adjustable vulcanized fiber chin rest supplied standard.
- Lightweight but strong.

AO "Weld-Cool", the first White Fiber Glass Welding Helmet — a cooler helmet that reflects 70% of radiant heat — now offers another "first"! Helmet interiors are now finished with a new coating, the only coating that offers these four advantages! It took 2½ years of research and development to produce this coating.

Your nearest AO Safety Products Representative can supply you.



MANHATTAN

THE ORIGINAL *SAFETY BACK* FLARED CUP

The first wheel to offer the exclusive features of the Safety Back Flared Cup! This totally new concept of design *and* construction puts portable wheel *safety* where it counts the most — in *original* strength and breakage resistance! With Safety Back, steel covers the entire back of the flared cup . . . extends down the side to assure a degree of reinforcement never before available with anchor bushings, safety rings, special hub mountings or ordinary revolving cup guards.

You can't get a safer wheel to use . . . and you can't find a better performing wheel to use on your portable grinders. Every Manhattan Safety Back Flared Cup is custom-bonded with the right abrasive for *faster* removal of *more* metal on your particular job — at no extra cost!

For faster cutting, longer lasting, *safer* abrasive wheel performance — "More Use per Dollar" — be certain you get the original Manhattan Safety Back Flared Cup. Let your Manhattan abrasive wheel engineer show you the exclusive advantages of this and other Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

- Greatest Initial Strength
- Easy Mounting — Easy Operation
- Highest Safety Factor
- Requires No Adjustment
- One Piece Assembly
- Improved Mounting Base

"MORE USE PER DOLLAR"

ENGINEERED RUBBER PRODUCTS . . . MORE USE PER DOLLAR

RM

RM 1060

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

NEW!

Linde SIGMATIC Welders

SWM-13 cart-mounted unit with separate control cabinet rolls readily over hoses, minor obstacles, slings easily from adjustable handles.

SWM-12 sled-mounted unit with separate control cabinet passes easily through small openings, can be slung from rigid tubular handles.

for All Mig Welding Jobs

SWM-11 features compact mounting of wire feed unit and wire spool on angular welded steel structure; combination continuous-fusion and spot-welding unit, SWM-11-S, is also offered.

LINDE's new "Sigmatic" line gives you the most adaptable and versatile mig welding equipment available today. With one of these units, you can weld virtually any metal, in almost any thickness. You can use wire from .020 in. to 3/32 in. diameter (including cored wire) and any shielding gas you select.

Versatility is engineered into the "Sigmatic" line. On the SWM-11, you can change from horizontal to vertical wire feed in minutes. With any unit, you can use conventional "spray-arc" or the LINDE "short-arc" process which has proved so successful on thin steels. Dual-purpose units are available which handle both spot welding and continuous fusion welding.

Several styles of torches are available, ranging up to 500-ampere capacity. Control cabinets are designed and wired for maximum ease of service and for internal addition of special operating features selected to fit *your* needs.

The same development and laboratory facilities that planned and built this equipment are available for help in applying it to your welding problems. For information on a demonstration see your LINDE representative. Or write for catalog F-1372, Dept. WE-05, Linde Company, 270 Park Avenue, New York 17, N. Y.

LINDE COMPANY UNION CARBIDE

"Linde", "Sigmatic", and "Union Carbide" are trade marks of Union Carbide Corporation.

At Kaiser Steel Corporation's Fabricating Division, a Model 30 Iriditron is used to spot-check plate welds on the bow section of a steel barge. Light and easily carried, requiring no outside power supply, the Model 30 uses iridium 192. It can take internal and panoramic exposures not possible with standard equipment.

Remote control of iridium... with Budd Iriditron units

- **Especially designed for remote handling of iridium 192**
- **Excellent for panoramic and internal exposure**
- **Permits exposure of iridium sources by remote control as far as 50 ft. away.**

Skid mounted or portable, this Budd Iriditron unit provides all the versatility of the traditional unshielded source for pipe weld radiography, panoramic exposure of multiple specimens, circumferential and longitudinal welds in boilers and pressure vessels. The unit can hold extremely strong sources . . . as much as 30 curies of iridium 192, approximately equivalent to a 260 KV X-Ray machine. This adds up to significant reductions in exposure times.

And you get complete service from Budd—including radioactive source supply and encapsulation, source replacement and disposal, training for your personnel (at no charge) and aid in setting up complete radioactive facilities.

Write or call Budd Instruments Division for our Gamma Radiography Bulletin . . . or for a consultation on your requirements.

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MAY, 1960

Welding Engineer

ESTABLISHED 1916

The evil: complacency

A FEW MONTHS AGO, a new and somewhat revolutionary type of welding machine was introduced to American industry.

Representatives from the metal-working field stopped, looked and listened but, as of this writing, had not purchased one of these $22,000 welders. However, on the strength of editoral reports published in this and other magazines, a Japanese company did order—sight unseen—three such machines.

This $66,000 order is indicative of what is happening all over the world. Other countries are striving to match the industrial might of the United States . . . no, they are trying to surpass it. And if complacency about foreign competition continues, surpass us they will.

Ask the sewing-machine and bicycle manufacturers . . . ask the radio and business-machine industries about foreign competition. They'll tell you. Even the shipbuilding people have felt the bite because foreign shipyards use more welding and cheaper labor.

Aided and abetted by some elements in this nation who encourage foreign competition, these countries nevertheless seem willing to pay for better manufacturing methods if it means they will be able to sell the American market, or compete with American industry in other markets of the world.

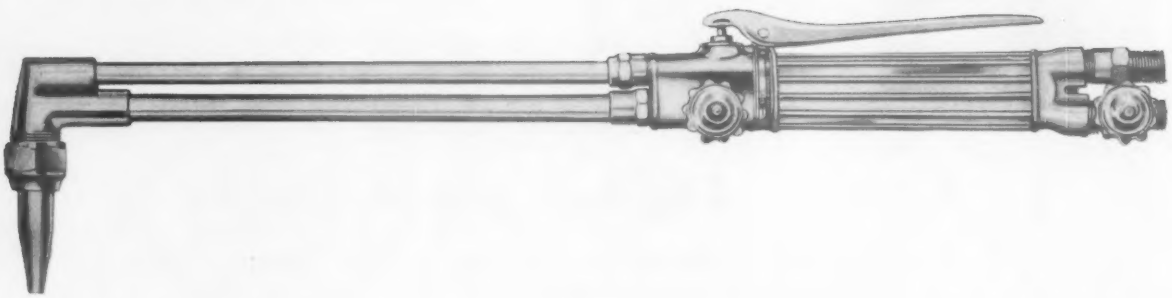
The labor costs, of course, cannot be overlooked. It is the wide differential in pay scales that gives other countries the edge over us. And union leaders continue to make it tough for us to compete.

But modern machines can help increase our production to a level constant with the wage scale. Using the latest in welding methods, for example, is a sure way to overcome the handicap of high labor costs. Of course, the worker must still produce, but automated processes will help him produce more.

And our workers need not fear automation. We now have more automatic machinery in use than ever before, and we also have the largest labor force in history.

No, the problem is not displacing men who need jobs. The problem, or rather evil, is complacency—which will eventually result in displacing entire plants and industries.

WHAT FEATURES DO *you* NEED IN A CUTTING TORCH?



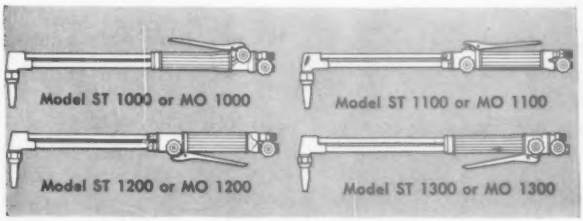
In the Victor line you'll find all the features you want! You have a choice of preheat gases, heads, lever positions, lengths, wide operating range.

FOR ACETYLENE: Model ST and MO series hand-cutting torches.

OTHER FUEL GASES: The new Model STN series hand-cutting torches with improved injector type gas mixers operate on either low (2-6 oz.) or medium pressure natural or propane type gases. This design has been thoroughly field tested and proven for maximum performance and efficiency.

HEADS: You can have either Everdur bronze (ST) or Monel (MO) head, angled at 90°, 75°, 180° . . . or 45° (ST models only).

OXYGEN LEVER POSITIONS: Four, as shown.



LENGTHS: 21", 27", 3' and 4'. (Special lengths on request).

OPERATING RANGES: Standard ST and MO models cut to approximately 8", using acetylene tips to size 5. Heavy duty (HD) models are available for work requiring tips above size 5, for gouging, scarfing, scrap cutting, etc. The new STN series use natural or propane type tips to size 8.

Remember, you can get Victor cutting attachments and machine cutting torches for use with acetylene—also for use with low or medium pressure natural or propane type gases. For the finest choice in cutting equipment, call on your Victor dealer now.

VICTOR EQUIPMENT COMPANY

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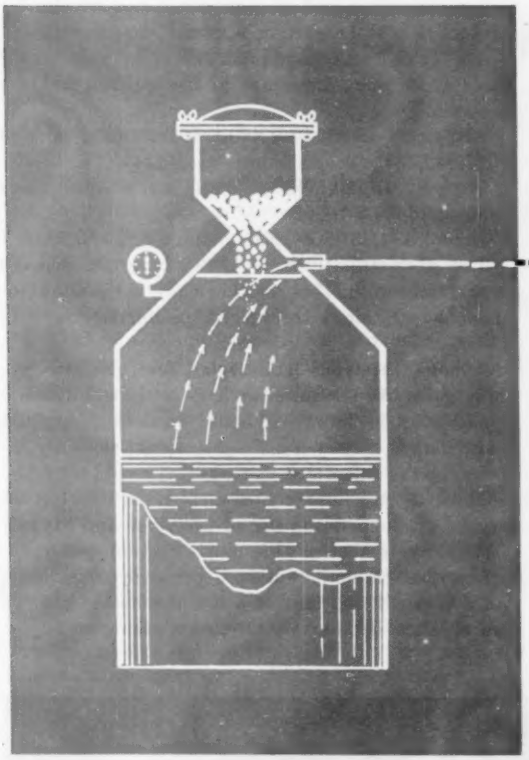
VICTOR for cutting

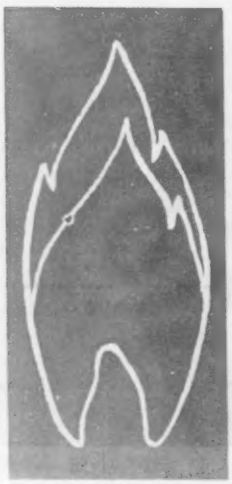
MFRS. OF WELDING & CUTTING EQUIPMENT; HIGH PRESSURE AND LARGE VOLUME GAS REGULATORS; HARDFACING RODS, BLASTING NOZZLES; COBALT & TUNGSTEN CASTINGS; STRAIGHTLINE AND SHAPE CUTTING MACHINES.



WELDING ENGINEER

salutes
the
IAA
during
this . . .

The 60th year of the gas welding torch



THE GAS TORCH is equally useful to an Egyptian silversmith, to a Greek ironmonger, or to a metalworker from Rome.

This is true not only today, but during that time in history when those ancient civilizations were the bustling centers of the little-known world.

Using a liquid fuel, such as alcohol or oil, the ancients were able to produce a flame which could be blown on the metal piece they were working.

Considering this as the earliest application of the welding flame, the torch should celebrate its 60th century rather than its 60th year as a metal welding and cutting tool.

However, it was the development of the first successful oxyacetylene torch by French scientist Edmon Fouche in 1900 that really brought the welding and cutting flame as we know it into the world.

Destined to continue to play its role on the industrial stage, the gas process is far from dead. In some respects, its future was never brighter.

Shipments of industrial gases in 1959 totalled $800,000,000, a gain of 10% over 1958.

And the outlook for 1960 is just as good — another 10% increase is expected, according to the Business and Defense Services Administration, U. S. Department of Commerce.

The industrial gas industry produces most of the commercially important elemental gases (oxygen, argon, hydrogen, nitrogen), as well as some compound gases (acetylene, carbon dioxide).

This eight million dollar total, however, represents only a little more than 1% of the sales of all chemical manufacturers.

At one time the welding industry was the primary consumer of most of these gases, but the picture is changing. The welding industry now takes a minor portion of the total output.

(Total output is not known since much of the gases are consumed where produced and are not reported as shipments.)

Because of their significance to much larger industries, gases are important to the national economy. For example, oxygen, nitrogen and argon are essential to production and fabrication of steel, titanium, aluminum, magnesium and other metals. Gases are also important in rocket, space and atomic energy programs.

The 1959 total consumption and dollar value of the three gases most important in the welding industry are as follows:

Acetylene: 12,052,986,300 cu ft for a total value of $367,943,721.

Oxygen: 45,124,298,600 cu ft for a total dollar value of $304,279,862.

Argon: 494,381,200 cu ft totalling $32,110,269.

The steel strike directly affected oxygen demand in the second half of 1959, finally accounting for about a 40% drop in oxygen production.

Although acetylene and argon were also affected, these gases did not suffer as large a cutback because applications in other industries tended to support their markets. Other gases were not so seriously affected by the strike.

Three factors have contributed greatly to the increased production and use of acetylene and oxygen:

(1) Development of new uses for these two gases.

Acetylene formerly was used primarily in welding, but it is now being used as a raw material in plastics and chemical production. Oxygen is taking an impor-

Photo Courtesy National Carbide Co.

tant place as an essential raw material in steel production.

(2) Changes in transportation methods.

Large liquified gas containers holding thousands of gallons of liquid and weighing about 1 lb of container per pound of contents have taken over from the 150 lb cylinders carrying 20 lb of gas. Result: reduced delivery costs to the consumer.

(3) Construction of oxygen plants at users' sites.

Gas is piped directly to the site of operation, thus virtually eliminating all gas transportation costs. Because these gas plants operate at relatively low pressures, capital costs have also been reduced.

In view of these facts, figures and factors, it would seem that the gases used in the welding, chemical and plastic industries face a bright future.

However, in order to obtain a complete picture rather than just a "charts and graphs" view, WELDING ENGINEER has asked top management men in the gas and gas-welding apparatus field for their views on the future role of the industry. These leaders are *not* all of the same opinion.

L. L. McBurney, president,
Smith Welding Equipment Corp., Minneapolis;
retiring president, International Acetylene Association.

While the IAA is greatly concerned and vitally interested in the continued growth and importance of the oxyacetylene welding industry, our efforts have constantly been in the direction of the many technical aspects related to safe production, transportation, storage and use of acetylene.

The experience learned in the safe handling of acetylene in all its many applications permitted it to make a vital contribution to the safe use of other more recent products used in industry.

One cannot help but be optimistic in evaluating the acetylene future. It will continue to rate a high place as an essential of modern industry.

Joseph C. Smith, president,
Weldit Inc., Detroit.

The future of the gas welding and cutting fields is in for a considerable change. New methods of electric arc and inert-gas welding have taken over a great many fields where gas welding was supreme, although there is a definite increase in bronze brazing.

The gas cutting field is also undergoing quite a change; from the use of acetylene as a fuel gas to natural gas and LP gas, making torch cutting more economical and also producing better results.

While the applications in the gas field are changing, there is a good future in prospect for the industry, in new areas as well as old.

H. E. Piggott, president,
Dockson Corp., Detroit.

We are very confident that the gas welding industry will continue on an upward trend, as it has over the past number of years. We realize that the arc welding industry has made wonderful strides in the past several years. However, it seems to have developed additional uses for oxyacetylene equipment.

Our continued increase in volume on oxyacetylene apparatus has given us confidence to build our future on this industry.

Morgan H. Potter, vice president,
Marquette Mfg. Co., Inc., Minneapolis.

After sizable increases in sales volume of oxyacetylene welding and cutting equipment during not-so-booming 1958 and again in 1959, we are indeed optimistic about the future of oxyacetylene welding and cutting in America's economy picture.

While the original fabrication of metals by oxyacetylene welding may have bowed in some respects to more automatic processes, many of these same processes combine some elements of oxyacetylene's apparatus. And the whole field of fabrication and maintenance, and repair welding has received a definite boost.

Looking ahead, we can only adopt an optimistic attitude as every indication points to an ever increasing opportunity. Alone or combined with arc, oxyacetylene welding and cutting equipment has a tremendous future.

C. M. Taylor, president,
The Harris Calorific Co., Cleveland.

After many years in the arc welding industry, I thought gas welding belonged to the past and that with properly designed electrodes, arc welding would eliminate practically all gas application. To my surprise, I find that sales of gas welding torches and tips is steadily increasing. Where cutting is a necessary part of welding, the sales volume will definitely increase.

The use of natural gas or propane as a fuel gas to replace acetylene in cutting will substantially reduce costs and improve quality, which should mean more gas cutting will be used.

Several years away is the fuel cell engine that will probably use oxygen and hydrogen, creating a large demand for these gases, together with apparatus for controlling them.

its past . . . . . present . . . . . .

Karl H. Schmuldt, vice president,
The K-G Equipment Co., Inc., Allentown, Pa.

(Mr. Schmuldt's statement was received by the editors several weeks before his untimely death. Because of its continued timelessness, it is included here.)

Gas welding has achieved a static level of industrial utilization. It is, and will remain, a process of our industry among those most paramount. It is a process taken for granted, well understood, and automatically employed. As such, it lacks the dynamic vitality which is part of the other welding processes.

We are developing for welding's future, to improve the time-honored tools of gas welding and cutting, as well as new tools for our industry which will work at great speeds and extremely high temperatures. Gas welding and cutting are the foundation on which a greater welding industry of tomorrow will grow.

Elmer Smith, chairman of the board,
Smith Welding Equipment Corp., Minneapolis.

In 1914 I was told on good authority that oxyacetylene welding had reached a point of saturation and growth possibilities were very limited. Of course, we did not believe this.

Oxyacetylene welding has progressed beyond our original concepts and I see nothing but improvement in its continued growth. It has not suffered from other processes; gas welding and cutting seems to have the faculty of affiliating and supplementing these other applications.

While there is need for constant technical research and development, I feel that oxyacetylene welding is still on the upward swing and will continue to be an all important part of most industrial applications.

Joseph Holt, west coast pioneer
in the field of flame-straightening.

Anything made of steel can be reclaimed by proper application of heat from the oxyacetylene torch when damaged parts are bent.

But engineers do not know the possibilities and will make no attempt to learn anything not taught in our universities. The average engineer does not know his steels, stresses or heat input.

There should be a program in all engineering courses in universities and technical schools to train men in the application of plain common sense. The oxyacetylene torch is the best tool in any engineer's repair kit. They must learn to use it.

If the welding world will wake up, all weldments will be at least 10% stronger in the weld area.

Richard L. Deily,
Messer Cutting Machines, Inc., New York City.

The use of oxacetylene welding should increase to a large extent, particularly since small diameter pipe is best welded by this process. Light gage welding in automobile body work and other such operations should also increase. In oxygen cutting, we can look for an increase in the absolute usage as the metalworking field expands.

However, the relative position of acetylene as a fuel gas for oxygen cutting will probably stabilize at, or somewhat lower than, its present position. In both fields, I am of the opinion that continuous development and research is still needed and will pay big dividends to both user and manufacturer.

E. L. Mathy, president,
National Welding Equipment Co., San Francisco.

The question arises as to whether or not the flame of the cutting and welding torch might be extinguished. It never has and it is doubtful that it will in the foreseeable future. The welding industry will continue to make great headway and devise more modern processes and equipment.

We are looking forward to continued growth and it has never occurred to us, during 50 years in this fascinating industry, that the future of our company or of its products will diminish.

Those of us who have had the great privilege to serve this industry have much cause to feel gratified and proud of its achievement and of its future. We are watching with deep interest the splendid dedication of the young men who will now carry on.

L. W. Stettner, president,
Victor Equipment Co., San Francisco.

Our gross sales in 1959 were 19% over the previous year. Consequently in 1960, we anticipate a 15% increase in apparatus and accessories, and 25% in the hardfacing line. While our gas volume represents 15% of our total sales, nevertheless, we are selling at a price, and this line compliments our other business.

While I do not know what other manufacturers are doing — other than some complaining — our business seems to be forging straight ahead.

I personally look forward with great enthusiasm to the balance of the year for the entire welding industry, particularly in gas apparatus.

. . . . and future . . .

Carl F. Smith, president.
Rexarc Inc., West Alexandria, Ohio

Acetylene has played a major role in the development of the industrial age, and the phenomenal growth of the welding industry, which has just about doubled itself every five years since the turn of the century. Acetylene is indeed the "old reliable."

With the advent of other gases, and electric arc welding, with their increased usage, there is some concern about the future of acetylene. This is good and should be recognized as a basic factor necessary to progress. We should take a practical look at the matter and develop a more effective selling program for acetylene. It is not an either/or matter; there is a basic need in our economy for all of these.

Acetylene has always been sold more or less negatively. A positive approach would make a noticeable difference immediately, and acetylene can certainly be expected to continue its march to greater use and a greater, more profitable future.

Eugene J. Morse, executive vice president,
The Burdett Oxygen Co., Cleveland.

The future of this industry is without limit. We have in the past two years spent approximately some $3,500,000 on new manufacturing equipment, as well as facilities, tanks and trucks to utilize liquid gases.

The demand for gas in this form is unlimited and as this volume production developes, our delivery costs are materially reduced, sufficiently so as to stimulate additional consumer interest.

Automatic shape cutting machines, small portable cutting machines and the medical field, all have substantially increased the requirements of fuel gases and oxygen.

In the medical field especially, the demand for oxygen multiplies as oxygen therapy is prescribed more and more.

All our plans for the future do not require as substantial a sum as was spent in the last two years, but it will be close to $2,000,000.

D. H. Fleming, manager, gas products development,
Linde Co., Newark, N. J.

Presently, arc welding far overshadows gas welding, a situation which has existed for at least 10 years and will continue through the next decade. Nonetheless, gas welding in itself has steadily grown in importance and will continue to do so.

The annual consumption of apparatus and consumables for gas welding now constitutes about 17% of all welding sales in this country, compared, for example, to 10% from the sales of gases, equipment and electrodes used in inert-gas welding.

In cutting the situation is reversed. Here oxygen cutting far overshadows the electric arc despite its usefulness, particularly in the non-ferrous field. And new technical advances can be expected to further even greater acceptance of oxygen cutting.

Oxygen cutting on a mechanized basis is gaining increased acceptance for the preparation of plates in shipbuilding. The trend is to discontinue the use of portable cutting machines and to substitute larger units.

G. C. Cusack, president,
Pure Carbonic Co., Div. of Air Reduction Co., Inc.;
and president, Compressed Gas Association.

Each year thousands of requests for information on the proper use and handling of compressed gases are received by CGA. The process of education is now mandatory, and we are making every effort to see that it is accomplished.

The welding industry, virtually founded on the application of the oxyacetylene flame, has long been aware of the great need for intelligent handling of compressed gases and application in industry.

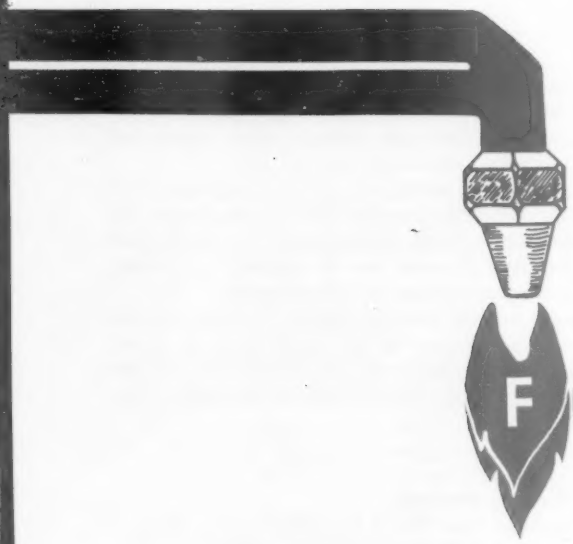
I like to think that the success of the welding industry, its surging growth, are due in part to the acceptance of CGA's recommendations.

J. L. Adank, president,
National Cylinder Gas Div., Chemetron Corp.,
Chicago

Prospects seem favorable for many more happy anniversaries of gas welding and cutting. True, other methods have supplanted oxyacetylene welding for many jobs, but to me the evidence is clear that there will be further increases in the use of both gas welding and cutting.

Almost every day we hear of new applications for gas welding. The relatively new method of optical lofting will materially increase the use of gas cutting.

With continued increase in all kinds of steel fabrication, gas cutting and welding are bound to increase even though the ratio of increase for gas welding will not be as high as that for other methods.



Fundamentals of oxyacetylene welding

ANY METAL CAN BE WELDED, provided the proper technique and the correct welding process is used.

This statement, with some modifications, applies equally as well to the oxyacetylene welding process. Practically every metal can be welded by this process, although a few of the more difficult metals are probably welded more satisfactorily by some other method.

As in all other welding processes, however, too much emphasis cannot be placed on cleanliness. A dirty joint can cause much trouble and eventually lead to incomplete welds, gas pockets, blowholes, inclusions and other potentially serious weld defects.

A caustic soda and water solution, or carbon tetrachloride, will readily remove oil and grease from base metal. Excellent as gasoline may be as a solvent, it is never recommended because of its potential fire danger. Flame-cleaning can also be used to remove oil and grease, as well as paint.

Chipping and wire-brushing are generally recommended for removal of shop dirt and light rust. Heavy rust and scale should be removed by manual or mechanical chipping, flame-cleaning or grinding, and wire-brushing.

The light metals (aluminum, magnesium) should be thoroughly cleaned with a chemical solvent. Edges should then be filed or wire-brushed vigorously to remove oxides. An acid pickle bath may also be used.

In oxyacetylene welding, four basic weld joints are used: butt, fillet, lap and flange.

The commonest and most simple weld joint is the butt weld. Since it is the strongest of the four when made properly, it should be used wherever possible. A butt weld consists of welding along the joint formed when two plates are brought together. Edge preparation for this type depends on the thickness of the plate.

The second most common weld joint is the fillet weld. To obtain maximum strength from this weld joint, it is necessary to carry as wide a weld pool as possible, *e.g.*, weld pool cross-section must be equal to base metal thickness at all points along the seam.

Since such wide weld pools are seldom used, the fillet weld should be avoided whenever another type joint can be used instead.

A lap joint is used to join the edge of one plate to the face of a second plate when placed one above the other. One disadvantage of this weld joint is its lack of bending resistance. A double lap weld is better in this respect, but requires twice as much welding and weld metal as the butt joint.

The flange weld joint, which is used on thin (20 gage or less) sheet metal, requires no filler metal. The flange acts as the weld metal and should be equal to sheet thickness. It is important that penetration be complete.

Tack welds may be used to hold plate edges in alignment, but the tack welds must be melted into the weld pool during the operation.

Joint preparation is determined by the type of weld joint to be used. Figure 1 shows edge preparation for various thicknesses of low-carbon steel. These suggestions apply equally well for all weldable metals, except light metals which should also be notched.

All welds must be made in one or more of four common welding positions: flat or downhand, vertical, horizontal, or overhead.

Steel can be readily welded in any of these positions, and this is

also true of most other metals, although the vertical and overhead positions can be extremely difficult.

Four factors determine the position to be used when welding: cohesiveness of the weld metal; rod manipulation; flame force; and base and weld metal support. The relative importance of these factors for the four positions are shown in table 1.

Filler metal is generally added to the weld puddle in the making of every weld. For satisfactory results it is essential that this filler metal be similar in metallurgical and physical characteristics to the base metals.

Since commercial welding rods are made to definite specifications, it is recommended that they be used rather than "any old wire."

Many readily-welded metals require a flux to insure a good weld. Flux primarily serves to prevent oxidation, dissolve oxides, release trapped gases and slag, and to cleanse the base metal during welding, soldering and brazing.

Flux is used in either a powdered or paste form. In the former, the welding rod is dipped directly into the powdered flux, while in the latter, the paste is painted on the rod and the joint edges prior to welding. A flux paste can be made from powdered flux by dissolving it in water or alcohol.

When welding cast iron and most nonferrous metals, flux is essential. On completion of welds, all flux and slag must be removed.

Equally important in oxyacetylene welding is selection of the proper size welding tip. Too small a tip will increase the time needed to bring the base metal to a welding temperature, or possibly prevent any weld being made. Too large a tip will probably result in burning the base metal.

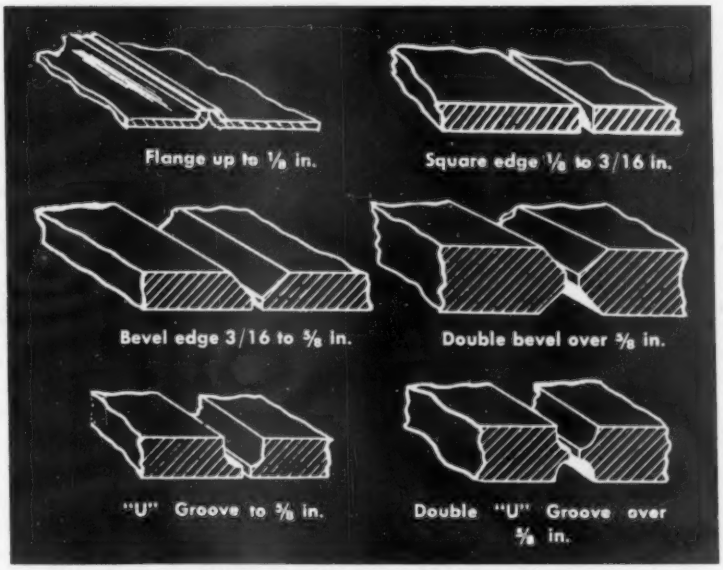

Flange up to 1/8 in.
Square edge 1/8 to 3/16 in.
Bevel edge 3/16 to 3/8 in.
Double bevel over 3/8 in.
"U" Groove to 3/8 in.
Double "U" Groove over 3/8 in.

FIG. 1 — Different thickness steel plates require different edge preparation.

The recommendations of the welding torch manufacturer as to proper tip size to be used for a given thickness should be followed closely. Should the recommendations not be available, table 2 can be used as an indication of tip sizes and gas pressures for a balanced pressure torch when welding various steel thicknesses.

The oxyacetylene flame itself can be one of three types: neutral, carburizing or oxidizing, with the first being preferred.

A neutral flame is produced by burning the correct mixture of oxygen and acetylene. A clear, well-defined white cone indicates the flame is correct and that neither gas is being wasted. Welds made with this flame should be free of burned metal or hard-spots and be thoroughly fused.

A carburizing flame is produced by burning an excess of acetylene. It introduces carbon into the weld and is recognized by the feathery edge of the white cone. Some metals are welded with this flame since additional carbon is desired.

A shorter envelope and a small pointed white cone identifies the oxidizing flame with its excess oxygen. This flame causes an oxidizing or burning of weld metal.

The appearance of the finished welded product will often depend on alignment, which varys with different jobs and different materials. For example, while steel plate may be welded without using jigs, aluminum pieces generally always require jigging.

If parts or surfaces must align accurately after welding is completed, jigs and fixtures become essentials. Without their use, considerable time would probably have to be spent in weld finishing.

When welding some materials, especially thin-gage aluminum, it is desirable to dissipate weld heat quickly by using a fixture fitted with chill blocks. The grooved back-up bar thus helps control the underside shape of the weld bead. Tack welds can also be used to maintain alignment between parts being welded.

Carbon blocks, rods and carbon composition or paste are often used as substitutes for jigs and fixtures, especially when making repairs on castings since carbon sheets and blocks come in many sizes and are readily shaped.

Carbon blocks used with vertical cast iron welds make it possible to

Weld Position Factors

Factor	Flat	Vertical	Horizontal	Overhead
Support	1	3	2	4
Manipulation	2	1	1	2
Cohesiveness	3	4	2	1
Flame Force	4	2	3	3

Note: 1 is most important factor while 4 is least important

TABLE 1 — Relative importance of welding factors for four different positions.

accomplish heavy welds on a casting without dismantling it. It also makes it possible to reinforce the weld to any thickness desired by grooving the blocks.

Carbon paste is also an excellent alignment aid since in ball-shaped form it can provide a cushion under the piece being welded, supporting the piece without any chance of sagging.

Preheating of the base metal prior to welding or flame-cutting is quite common and offers four advantages: (1) reduced welding time; (2) reduced (or elimination of) shrinkage stresses; (3) reduced distortion; and (4) reduced weld deposit hardness and elimination of crack formation.

The methods of preheating depend on the size, shape and material of the piece to be welded. In some cases, especially with small pieces or where localized heating is satisfactory, a welding torch using city gas, LP gas or oil is used. Still another method is the fire brick furnace.

Two common welding techniques are used in oxyacetylene welding—forehand and backhand welding.

In forehand welding, the torch tip is inclined slightly forward in the direction of the weld, and the welding rod is held ahead of the flame. With the flame and rod in this position, the rod will prevent the heat of the flame from reaching the bottom of the joint ahead of the weld puddle.

On thin material this is an advantage, but an oxidized weld is the usual result when forehand welding on thick material. To reach the bottom of the groove with the flame, the rod must be pulled out of the puddle and the protective envelope of the flame.

To overcome this disadvantage, the welding rod should be moved slightly to one side, allowing the flame to reach the bottom in one direction. Then with a semi-circular movement, the positions of rod and flame are reversed to heat the opposite side.

Five points will insure a satisfactory forehand weld: (1) The white cone must be kept from touching the welding rod. (2) Heat must be allowed to penetrate the joint bottom for the entire length of the weld. (3) The sides of the weld must be practically parallel to insure a uniform deposit. (4) Enough weld metal must be added to form a full bead. (5) The weld metal must be evenly distributed.

In backhand welding the flame is inclined backward on the weld metal just deposited. The flame is given a slight transverse movement while the rod following the flame receives a more pronounced, transverse, semi-circular movement.

The torch tip is held so that it makes about a 70 deg angle with the plane of the weld. The angle between the rod and the plane of the base metal is usually about 45 deg. Because of this rod angle, welds are rippled.

Using this technique, the rod does not prevent the flame from reaching the bottom of the groove or joint. The rod is manipulated in a manner which will thoroughly mix the molten metal in the weld pool, and at the same time keep the rod away from the flame to insure complete melting of the top portion of each ripple.

Backhand welding is especially desirable when welding any metal over ¼-in. thick. The advantages to be gained are: good penetration (since the rod is not a handicap); good fusion (due to constant weld puddle agitation); and faster welding (because of the torch flame's preheating action.)

The direction of the flame in backhand welding prevents oxidation since it covers the weld pool. A narrower bevel (60 deg) is recommended for backhand welding, a factor which reduces costs and speed production.

Prior to undertaking any welding job, certain principles should first be reviewed:

1—Always be sure the parent metal along the line of welding is heated to proper melting point.

2—Be sure to melt the base metal on both sides of the joint for the entire length of the weld.

3—Heat the welding rod and the base metal to a melting temperature before starting to weld.

4—Puddle the base metal and the filler metal together properly.

5—Filler metal from the welding rod should be added as steadily and as evenly as possible.

6—Use the outer envelope of the oxyacetylene flame to protect the weld metal from oxidation.

7—Do not reheat the weld metal after it has cooled.

There are many methods by which the torch and the welding rod may be manipulated during welding, but be sure your movements are systematic and properly executed. Should you want to change your technique, wait until the weld you are working has been completed.

Never melt the welding rod above the weld pool, allowing the molten metal to drip into the puddle a drop at a time. When the rod begins to melt and fills the groove, advance the flame slowly along the line of welding.

The rod end should be kept in the weld puddle while the pool of molten metal makes steady progress in the required direction.

Tip Sizes for Welding Steel

Base Metal Thickness	Tip Drill Size No.*	Oxygen psi	Acetylene, psi
24 ga. to 1/16 in.	70	3-4	3-4
18 ga.—1/8 in.	62	4-5	4-5
1/8—3/16 in.	54	4-5	4-5
3/16—3/8 in.	48	5-6	5-7
3/8—1/2 in.	42	7-9	8-10
1/2—3/4 in.	37	7-9	8-10
5/8—1 in.	33	8-10	9-11
1 in. and up	29	9-11	10-12

**While this tip size is recommended, the size of tip either a size larger or a size smaller may be used by adjusting the pressures of the welding gases.*

TABLE 2 — Tip sizes and gas pressures for a balanced pressure torch when welding various steel thicknesses.

The IAA in San Francisco

Annual convention to discuss safety, acetylene uses, cryogenics

SAN FRANCISCO, the city of the Golden Gate, will be the scene of the 62nd annual convention of the International Acetylene Association at the St. Francis Hotel on May 9 and 10.

Safety practices in the use of oxyacetylene processes and equipment, acetylene for chemicals, and cryogenics will be the principle subjects of the three main technical sessions.

The sessions, which will be moderated by members of the gas and chemical industries, will include speakers from various participating companies, as well as public officials and representatives from the educational field.

Highlight of the two-day meeting will be the Morehead Medal dinner to be held in the Grand Ballroom on Tuesday evening. This year the Morehead Medal will be awarded to Dr. C. G. Keel of Basel, Switzerland (see box).

A luncheon at noon on Monday will officially open the convention. Retiring association president L. L. McBurney, Smith Welding Equipment Corp., Minneapolis, will address the convention delegates. San Francisco's Mayor George A. Christopher is expected to attend.

The first technical session on Monday afternoon will be devoted to problems associated with production and use of liquid oxygen and other cryogenic fluids. C. A. Roller, Air Reduction Sales Co., New York City, will be the principal speaker.

President McBurney called attention to this session on cryogenics.

"With the current interest in missiles and rockets by the general public as well as by members of our own industry," he said, "the entire subject of cryogenics and engineering should provide fertile ground for the association's investigation and discussion."

Safety with emphasis on oxyacetylene will be the main subject of Tuesday morning's technical session. It will be a panel discussion on the factors in safe practices and their use as positive means for furthering industrial safety.

The Tuesday afternoon session will deal with acetylene for chemicals and will include a paper by Dr. Jesse Werner, General Aniline and Film Corp., on "High pressure acetylene chemicals."

Rounding out the convention schedule are the board of directors meeting, the Council of Past Presidents' dinner and the annual business meeting.

Should conventioneers arrive early or extend their stay in San Francisco, the Golden Gate City has much to offer in the way of tours, sights and entertainment.

Sight-seers can ride down-hill on the famous cable cars to Fisherman's Wharf, an area featuring world famous restaurants and the Balcutha, an authentic maritime museum.

Should visitors walk along Grant Avenue, they will enter the city's well-known Chinatown, where they can tour museums, temples, souvenir shops and Cantonese restaurants.

And, of course, a look at the renowned Golden Gate and San Francisco-Oakland bridges are a "must" on any agenda.

34th Morehead medalist chosen

DR. CHARLES G. KEEL, director of the Swiss Welding Association and editor of the Swiss Welding Journal, has been chosen as the 1959 James Turner Morehead medalist.

Presentation of the award, the 34th since its inception in 1922, will be made during the 62nd annual convention of the International Acetylene Association in San Francisco's St. Francis Hotel on May 10.

The award is presented annually for "advancement in the industry or the art of producing or utilizing calcium carbide or acetylene."

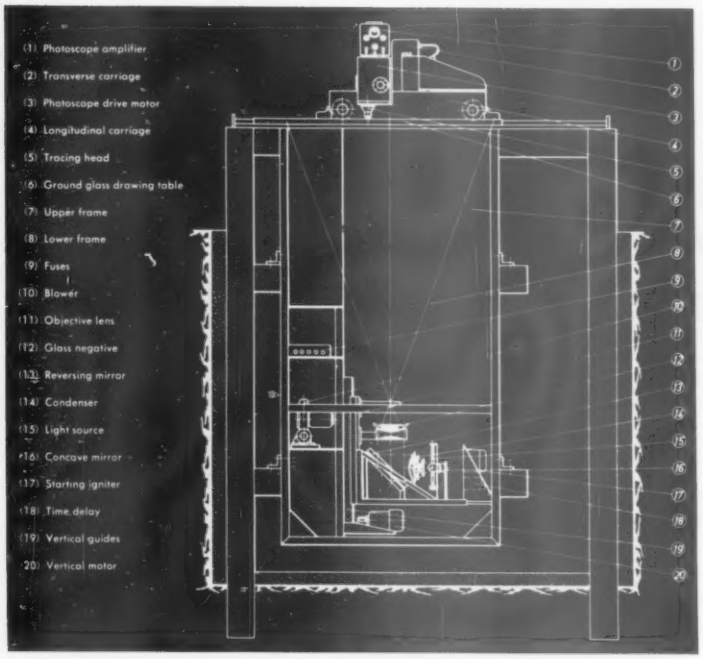
Dr. Keel was born in Fribourg, Switzerland, in 1911. He

Dr. Keel

has been married since 1941 and has a son and two daughters. (His own father was the famous Swiss welding pioneer, Professor C. F. Keel.)

In 1936, Dr. Keel received his engineering degree from the Swiss Federal Institute of Technology, where he returned 10 years later as a welding lecturer, and subsequently earned his doctorate there.

A member of various technical associations and committees in Switzerland and Europe, Dr. Keel is the author of "Grundriss der Schweisstechnik" and co-author of "The Oxyacetylene Welder." He has also authored more than 30 technical papers.



EQUIPMENT for projecting image on 1:100 glass negative (12) onto the ground glass plate (6) to the normal enlargement of 1:10 scale.

Better controlled dimensions with magnified template drawings

by **Richard L. Deily**
Messer Cutting Machines, Inc.

MAGNIFYING 100 TIMES directly from a scanned template drawing to the mechanical motion of an oxygen-cutting machine.

Such a process offers shipbuilding firms controlled template and finished plate dimensions as well as compatibility with optical lofting practices. An additional advantage: easier handling and storage of master drawings.

Welding practices developed in the U. S. during the war were grafted to shipyard operations dating almost as far back as the first use of steel in ships. European shipyards, on the other hand, rebuilding from almost complete destruction, adapted all shipyard practices to those principles welding demanded.

One major change was their lofting operation. By making this change, European shipyards opened the door to use of reduced scale drawings for direct control of oxygen cutting machines in production of steel plate shapes.

The most logical sequence when oxygen cutting with a system compatible to optical lofting would be to make a machine for direct operation from a photonegative.

However, enlargement and control problems of magnifying 100 times directly from optical scanning to mechanical motion demanded a more indirect but, design-wise, simpler and more accurate system.

The most natural procedure was to adapt the necessary template control to heavy-duty oxygen cutting machines already in use.

However, the usual small friction wheel drive of the customary cutting machine, besides generating only 20 to 30 lb pushing force, was not readily adaptable to advanced controls. Inherent in adaption of any advanced control method is the sine-cosine drive.

Developments in electronic controls as well as improvements in over-all machine design have permitted economical and satisfactory production of oxygen cutting machines with sine-cosine drives.

Such units with multi-torch setups weigh up to 5,000 lb and use powerful drive motors for the acceleration demands of oxygen cutting at speeds up to 30 ipm.

Of course, Messer's Sicomat with coordinate drive was first used in cutting with 1:1 templates.

Using reduced scale template on these large cutting units requires a pilot scanning machine and a feed-back servo-mechanism so that the cutting machine follows exactly the pilot's path at a suitably enlarged ratio.

The pilot-machine can be installed in any desired location for the particular yard practice. This pilot has a glass table plate on which the template drawing appears, either as the actual 1/10 scale drawing or as a projected image from a glass slide reproduction of the 1/10 scale drawing.

The template drawing consists of thin lines (either black on white or white on black) usually corresponding to 1/10 the width of the average cutting kerf, or approximately 0.010 in.

The photoelectric eye follows the center of the line by means of a differential photocell. In tracing, whenever the eccentrically supported photocell deviates from its center position on the line, the quantity of light seen by the photocell, and hence its voltage output, changes.

This output voltage causes the steering motor to return the photocell to its mid-position. And since the sine-cosine generator is mechanically connected to the photo-

SINGLE-arm extended 1:1 oxygen cutting machine has a working width of 2 x 100 in. x 8 ft. Scale of 1:10 would save time, work area.

cell steering motor, any rotation of the motor shaft will turn the generator, thereby instantly affecting the longitudinal and transverse drive motor speeds.

The control reaction will, in turn, feed-back to the pilot machine's driving motor controls so that the photocell is always interlockingly guided along the line centers.

The common characteristic of 1:10 template drawings is that the actual drawing is used on the pilot machine for direct control of the cutting machine. With the actual drawing as a template, there is no means of adjustment to known base line, however.

Therefore, the accuracy of the template drawing (both from a drawing practice standpoint as well as from dimension permanence of drawing materials) must be of the highest order so as to keep system errors within specifications.

The reason: because the 1:10 scale cutting system, by its nature, magnifies all scanned dimensions by a factor of 10.

Two factors have made development of a projection system for the pilot machine scanning table important: ability to make optical adjustments to a known base line, and the desirability of integrating the 1:10 scale cutting system to optical lofting practices.

For the projection system, a 1:10 scale template drawing is made from the body plans of a ship. This drawing is then photographically reduced 10 times so that a 1/100 glass negative results.

The distance between bench marks on the projected image can be measured and brought back to exact original size by means of optical adjustment with the projector. Thus, the possibility of drawing or shrinkage errors is minimized to predictable dimensions.

Maintaining controlled dimensions in the template, as well as the overall compatibility with optical lofting practices, are the main advantages of projected template drawings.

In addition, the master drawing can be maintained in permanent storage with additional glass slides reproduced at will under conditions which will preserve the original indefinitely.

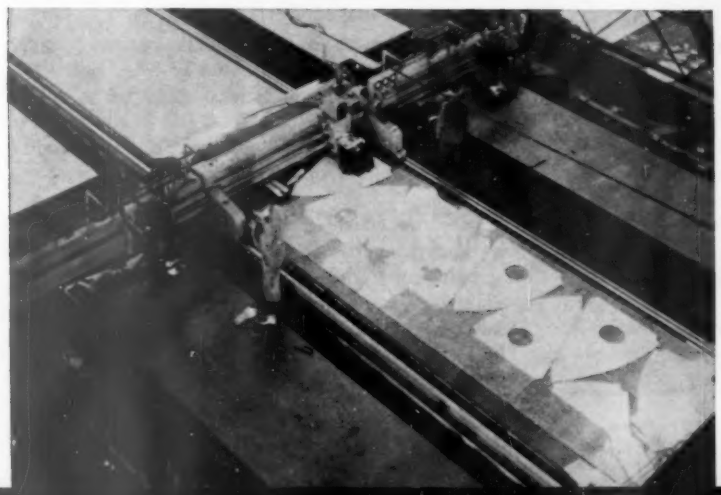
Another advantage is that any number of glass slides can be made from the master drawing for production of sister ships in the same or different yards. And finally, in shop use of the slides, filing is simple, handling is easier, less room is required, and they are less subject to damage than template drawings of any scale.

Further developments will be primarily in the template control area. But the basic design using a sine-cosine type drive will continue to be the backbone of the actual oxygen cutting machines.

In today's machine tool, the most advanced control uses a numerical director and there is no question that such computer-type controls will be used commercially on oxygen cutting machines in the near future. Presently, however, only laboratory-scale computers have cut steel plates by this means.

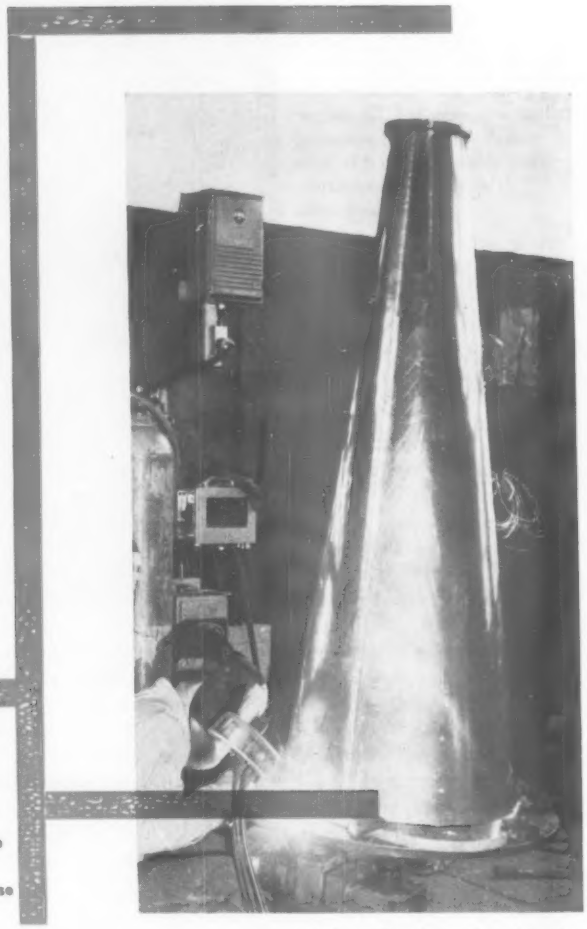
The numerically controlled oxygen cutting machine will perform work equal to, or better than, that of a 1/10 scale drawing pilot control. Even with the limitations of numercial control (primarly the difficulties of programming) no serious long-range drawbacks to the process are anticipated.

There is a very rapid trend toward reduced-scale drawing pilot-control of oxygen cutting machines and practices. The ultimate goal will be use of numerical controls since such controls are the only ones compatible with total industry trends in the United States.



DOUBLE-arm 1:1 machine with track and work-table in center. Although compact, a projected template image would solve many storage and work area problems.

TECHNICIAN stands at Perkin-Elmer short range theodolite used with the Jupiter missile. This is a secondary unit employed if weather precludes use of primary theodolite.



MIG welding is used to join the azimuth alignment theodolite cone to the base plate. Plug welds made with a Tig unit then join it to the spider assembly.

Missile optical systems housed in Mig welded aluminum cones

WELDING OF ANY COMPONENT parts of missiles and rockets used in the nation's space development program requires production control and operator workmanship which will guarantee high quality performance.

Recently, Glasco Equipment Corp., Paterson, N. J., undertook an exacting job of fabrication on aluminum housings for azimuth alignment theodolites for the Perkin-Elmer Corp., Norwalk, Conn.

The theodolite housings will contain electronic optical systems developed by Perkin-Elmer to set and control the azimuth heading for missiles and missile guidance systems up to the moment of launching.

(Azimuth theodolites are instruments used to measure horizontal and, usually, vertical angles; in this case, the angles created by measuring an arc of the horizon clockwise between a fixed point and the vertical circle passing through an object's center.)

Azimuth alignment theodolites of this type are already in use, or being produced for, the Atlas, Thor, Jupiter (shown here) and Mace missiles.

The housings, made of 6061-T6 aluminum, are composed of three parts: base plate, cone and spider assembly.

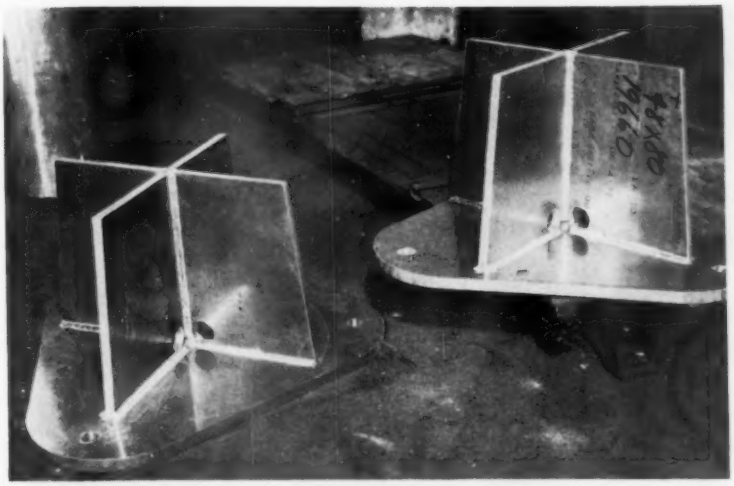
The spider assembly is welded first and consists of four uprights of ¾-in.-thick aluminum plate. These are welded together at right angles to each other. The outer edge of each upright is contoured to the slope of the cone which will later be fitted over it.

After the spider assembly is completed, it is welded to the base plate, which is a 1-in.-thick piece of aluminum measuring 28-in. square. The third production step is welding of the cone.

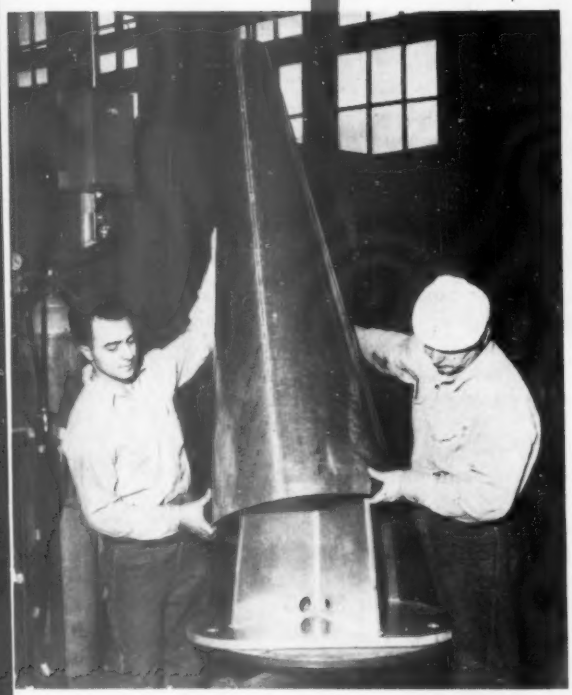
Cones are constructed of two identical pieces of curved plates vertically seam welded. They are of 12 gage aluminum and come in two sizes.

The smaller one is 48 in. high, with a 42-in.-diameter at the base and a 6¾-in.-diameter at the top. The larger plate is 68 in. high.

After it has been seam welded, the cone is welded to



SPIDER assembli[illegible]nd base plates of the theodolite hous[illegible]s are Mig welding. Cone is later p[illegible]ed over the assembly and Mig wel[illegible] to the base plate while Tig pl[illegible]welds join the cone to [illegible] spider assembly.



CONE is fitted over spider assembly prior to Mig welding the cone to the base plate and spider assembly. Entire housing is rotated on turntable.

the base plate and spider assembly on a turntable, which rotates the entire housing, allowing the weldor to sit in one spot during the entire operation.

The weldor first tack welds the cone to the base plate, then welds the entire circumference of the cone using a Mig welding gun with a 1/16-in.-diameter aluminum wire.

Later, plug welds to fasten the cone to the spider assembly are made by Tig welding. Both Mig and Tig welding units used were manufactured by Air Reduction Sales Co.

All weldors were ASME approved and certified by the armed forces to work on government projects where superior welding methods are demanded.

Glasco's long association with fabrication of stainless steel and aluminum components makes them fully qualified to use all existing welding techniques with results well within the range of today's exacting specifications.

AZIMUTH heading of Jupiter guidance system must be monitored until moment of launching. (Inset shows close-up view). Missile blast destroys theodolite which must be in close proximity at all times.

DUAL welding heads are carried by mono-rail above the welding table in track rail build-up. Photoelectric beam stops automatic rod feed between links, although they are buried in flux.

Photoelectric control aids weld uniformity

by Jim Melton

AN AUTOMATED welding process cuts by 80% the time required to rebuild rails and rollers for Caterpillar tracks.

While this is a significant contribution of electronics to the welding field, it is less important than the uniformity of the product, say the men who work with the process at Wheeler Machinery Co., Salt Lake City.

The company, headed by J. K. Wheeler, is Caterpillar dealer for Utah and portions of surrounding states, and operates the largest heavy-duty construction equipment plant in the intermountain area. It is the area's major rebuilder of crawler tracks.

Fastest wearing parts of a crawler are the rails and rollers of the track assembly. As the rails inside the track slide over the rollers, contact of the two surfaces gradually wears down both of them. The machine's weight rests on the assembly to add force to the abrasive action. How fast track rollers and rails wear depends on a number of things.

Chief factor in the life span of the roller-rail assembly is the use to which the machine is put. On a farm, for example, these components should last thousands of hours longer than they would where the machine works primarily on construction. Correct alignment in installation of the tracks is also important for maximum part life.

Original thickness of the rails on the big D9 Caterpillar is 5 in. Wheeler recommends new or rebuilt rails be installed when they have worn down 3/8 of an inch. The same tolerance is listed for D8 and D7 vehicles. On rollers for all Caterpillars, 5/8-in. wear is considered maximum.

Rebuilding of these parts is roughly comparable to retreading tires for vehicles that move on wheels. A weld bead is joined to the worn area as replacement for the missing portion of the original metal. This can be done by conventional manual welding techniques, but electronic controls make the job faster and more uniform.

With a submerged-arc welding method, photoelectric cells control the beads of twin welding heads. Track is laid out on the welding table and covered with flux. Using a mono-rail arrangement to pull the welding heads along above the track, the machine runs at a preset speed.

Its automatic dual wire feeds stop as the feeder heads pass over the gaps between the links (rails). Rubber pattern guides, mounted on the outboard side of the bench, cut a photoelectric beam to stop feed of the rods.

On another machine, a continuous weld process is used to rebuild the rollers. Welding heads on this machine add a continuous layer of new metal as the rollers are rotated against them. Flux feed is regulated by the operator, who handles eight rollers at once.

Flux is screened for re-use; or, in some machines, automatically sifted and returned to a feed bin. "Wear hardening" wire is essential to the process. As the rebuilt rail or roller surface is used, it is toughened by compression.

With an operator for each machine, it takes two days, more or less, to rebuild the average track. Normally, rails can be rebuilt once; rollers four or five times.

After two years use of this rebuilding process, the men at Wheeler remain enthused about it. They say the bead build-up will give at least 80% as much service as the original surfaces of the track rails and rollers.

Shop superintendent V. J. Barnes

estimated the rebuilding is done five times faster on the special machines than when using non-automated methods. However, the main advantage is uniformity of bead.

The company says it costs about half as much to have the track assembly rebuilt as it does to buy new parts. The big problem, according to Ed J. Andell, service manager, is getting track rails into the shop before they are too badly worn to rebuild. If wear exceeds the recommended limits, price goes up 50%.

To avoid lost time on customers' equipment, Wheeler offers an exchange arrangement most customers take advantage of: the customer turns in his used tracks and pays for rebuilding them, but takes a rebuilt set from stock.

Charge for building up the rails on a 43-section of D9 track totals $305 per track. At the bottom of the scale, the 32-section D2 track can have rails built up for $70 per track.

Using the D8 as an example, here are some typical costs, for both tracks:

—Building up links, including turning pins and bushings, $560.

—Building up links, plus new pins and bushings and installation charge, $1,194.

—Set of new rails, $1,834.

The D8 rails have 156 links (both tracks), costing $2.95 per link to build up.

So good is the weld that the line between the original metal and build-up could not be found in visual inspection of a rail cross-section that had been sawed off for demonstration purposes.

Parts manager Walt Voyles says the key to long wear for built-up rails is making the weld a part of the rail. This takes constant temperature, which the machine can control better than a weldor could.

Any variation in the power level would vary the width of the bead. To maintain a stable power supply, the firm uses a Caterpillar diesel engine to produce the closely regulated 460-volt supply required in its welding department.

ROLLERS are rotated against the welding heads on this submerged-arc welder.

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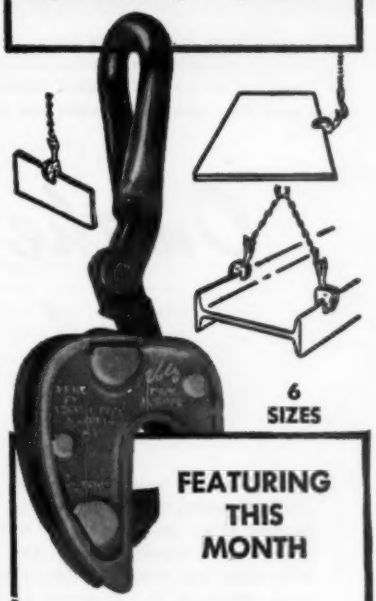

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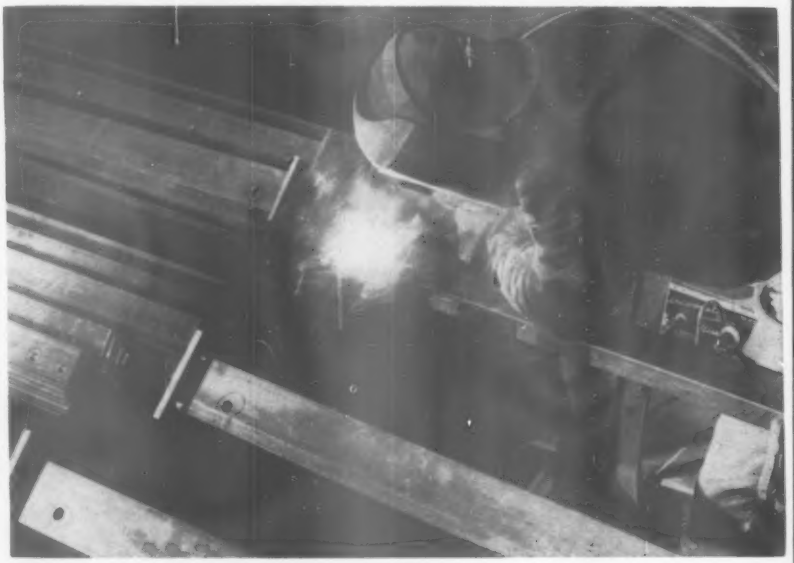
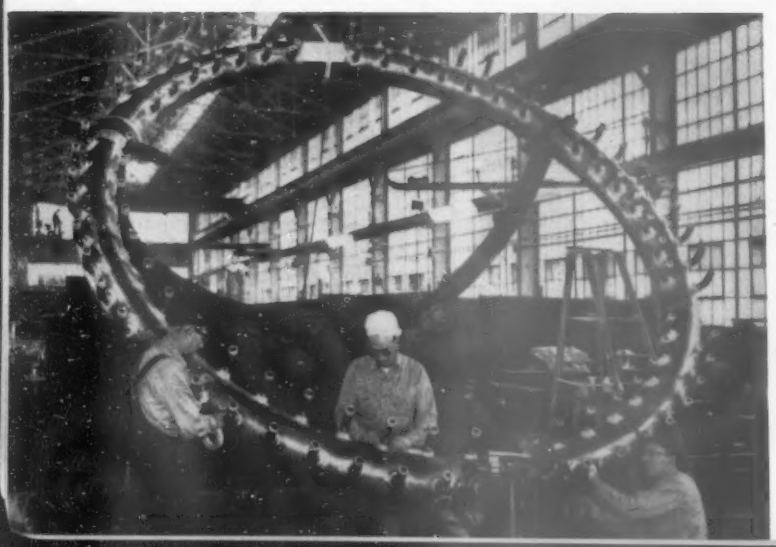
WHEN the Missouri river flooded during a pipeline construction job, anchors holding the barge on which the welding was done swayed off alignment. No anchors big enough to provide the required immobility could be found. Welders on the barge used 4-in. extra-heavy weight pipe to fabricate a large anchor.

ROOF crown is welded to roof of forward control truck delivery body at the Boyertown Auto Body Works, Boyertown, Pa. All panels, posts, ribs and cross members were made of steel produced by Jones & Laughlin Steel Corp., Pittsburgh.

On the job...

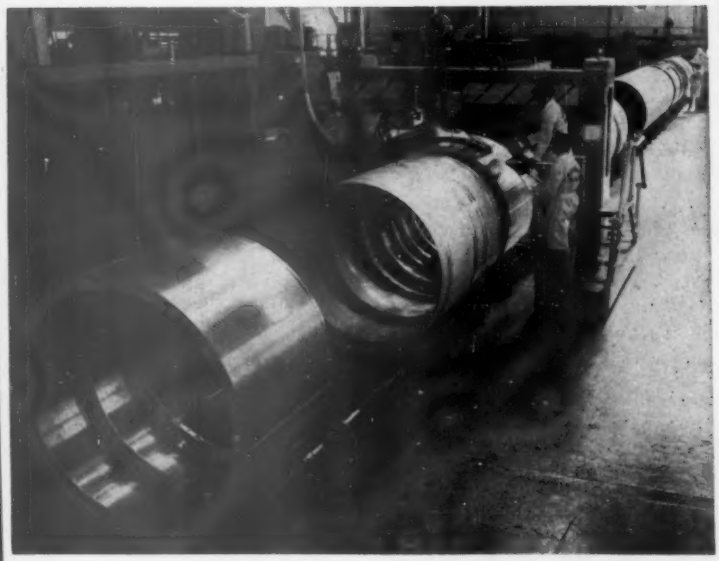
BASE plates are welded to the end of aluminum structural angles, as part of work on a sub-station terminus of an extra-high-voltage transmission line sponsored by General Electric Co., Schenectady, N. Y. Work was done in plant of Lee C. Moore Corp., Pittsburgh, for Aluminum Co. of America, Pittsburgh. The experimental line will be tested in western Massachusetts.



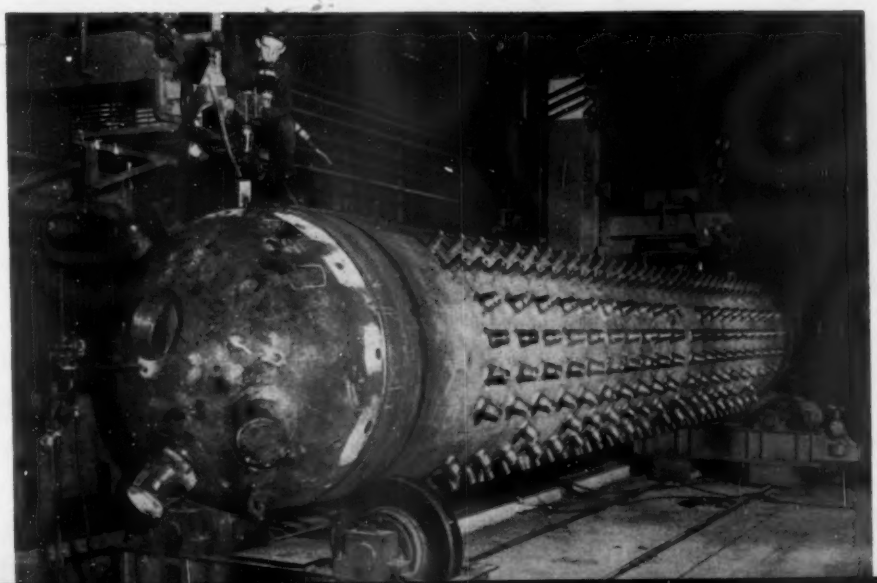


DRAVO Corp., Pittsburgh, was sub-contractor on outlet header for the new Hanford Plutonium recycle test reactor being built for the Atomic Energy Commission. Piping — of type 304 stainless, 10 3/4-in. O. D. and 0.750-in. wall thickness — is in three segments welded to form a 13-ft, 6-in. diameter ring. Visible are specially forged bull tee and some of the ninety welded 1½-in. outlets for water-cooling connections.

RINGS welded to natural gas pipeline serve to anchor pipe to massive concrete blocks. The rings are free to move vertically in the notch guides, and to a limited extent laterally. At average temperature pipe lies midway between sides of the notch. Anchor prevents stresses created by long bends from being transmitted through line.



OPERATOR controls and keeps watch on welding speed, amperage and voltage from control panel on movable gantry welder designed and built at Reynolds Metal Co.'s Sheffield, Ala., missile plant.



IN operation here is an automatic welding installation on 200-ton turning roll built by Ransome Co., Scotch Plains, N. J. Work is being done at Foster Wheeler Corp., Mountaintop, Pa.

SPACE frame nearing completion presents geometric preview of things to come in the new Upjohn office building.

Welding speeds building of large space frames

PRODUCTION-LINE procedure has made possible the rapid fabrication and erection of one of the nation's largest space frames.

At Kalamazoo, Mich., a new 450-sq-ft office building is now nearing completion for the Upjohn Co., pharmaceutical manufacturer.

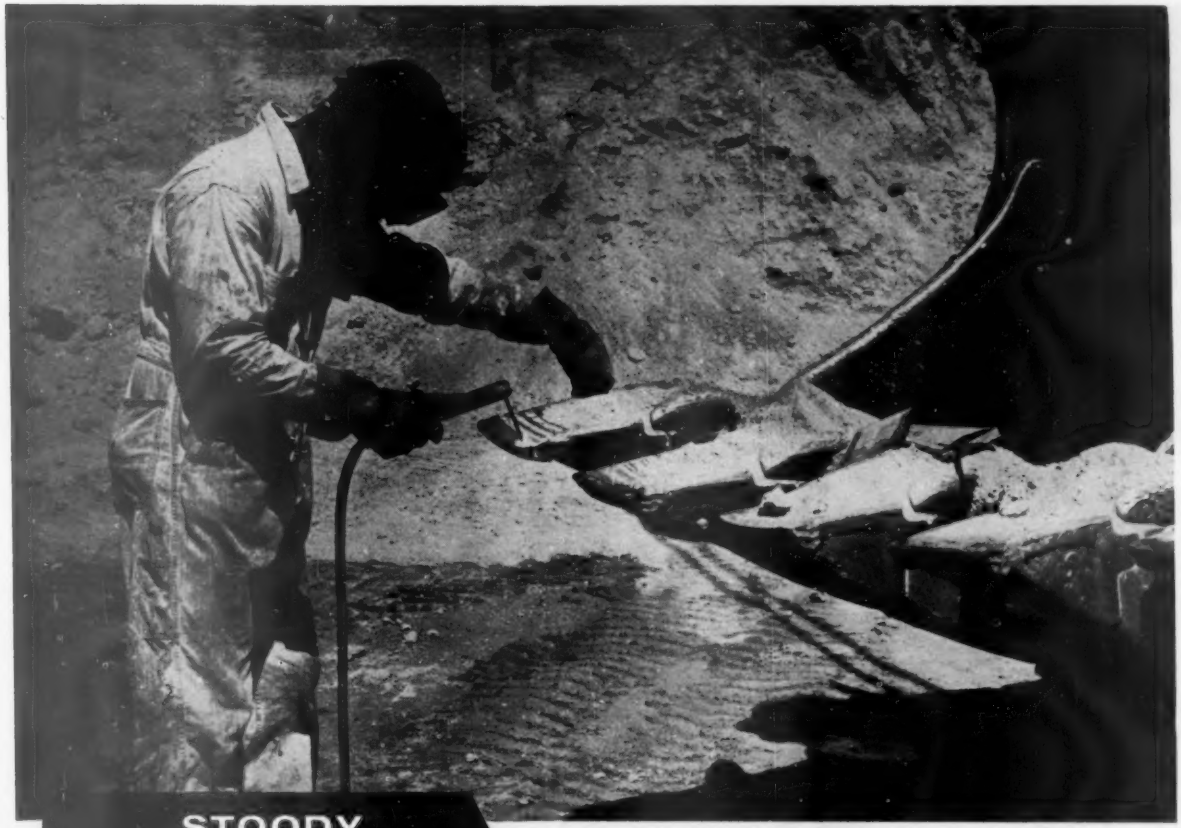
Designed by Skidmore, Owings & Merrill, the new structure is crowned with a 1,200-ton steel space frame of welded angle construction. Steel erection was completed in September, with occupancy slated for next fall. The steel erection and fabrication was performed by Whitehead & Kales Co., Detroit.

Space frame construction was considered at the outset to be the most economical, practical method of achieving the desired effect. A dozen different techniques were studied, including steel pipe, to arrive at the final selection of welded construction.

A pilot model was erected near the new building site and every critical joint was tested to failure before fabrication was started.

A full scale wood mock-up of one of the space-frame roof sections was built in the Whitehead & Kales shop to study all angles, clearances, weld points and welding techni-

AFTER top and bottom grids of space frame section were positioned, diagonal running angles were welded in place.



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STRINGER BEADS *of Stoody 121 and Stoody 100 applied semi-automatically keep buckets in good condition.*

Usual maintenance procedures just couldn't keep buckets and teeth in shape on this job...wear was too severe. The answer was found in the semi-automatic welder applying Stoody 121 and Stoody 100 to bucket lips, sides, and runners, and to teeth and adapters.

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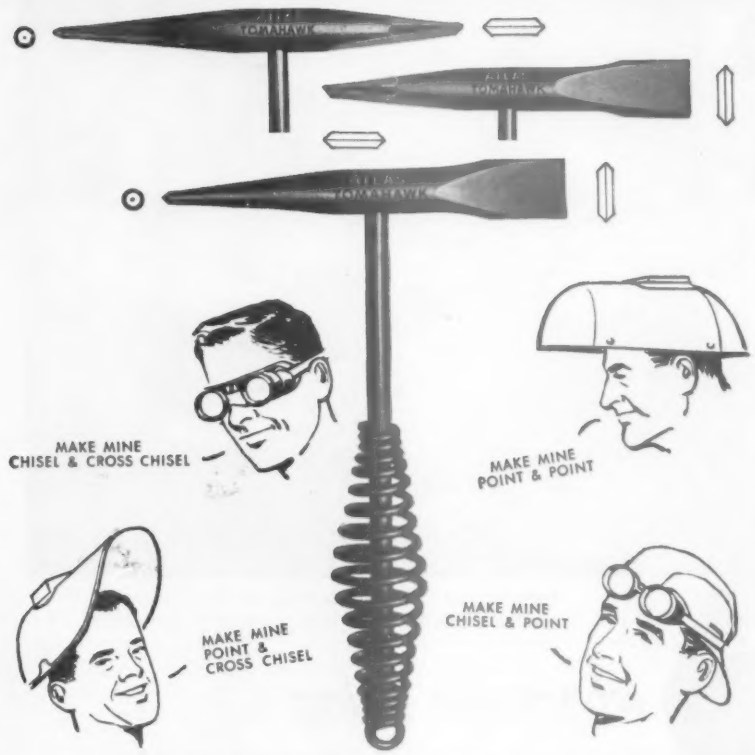

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ques. After this, additional wood models were made of welding and assembly fixtures. The resulting jigs and fixtures held tolerances to 0.01 in.

Two types of jigs, a grid subassembly jig and a final assembly jig, were used for welding the space frame sections.

Grid subassembly jigs positioned tees for assembling the top and bottom grids. Connector plates were also positioned and welded in these jigs.

In the final assembly jig, a completed bottom grid was put in place; diagonal angles laid in loose; then the top grid lowered to a resting spot on spacer columns in the jig.

Locking devices held the top grid in its exact vertical relationship to the bottom grid. Then, diagonal running angles between the top and bottom grid were tacked in place, and down-hand welds performed on the entire assembly. The partially welded section was then rolled over by hoist into a cradle, where the balance of the welds were completed.

At the job site, a "table top" erection procedure was developed to assure perfect alignment of the various space frame sections. This method utilized a series of falsework beams bolted to roof supporting columns for temporary positioning of the space frame sections.

Frame sections were placed side by side on these beams, then joined together with diagonal members already attached to the top chord of one section and ready to pivot down to meet the bottom chord of the adjacent section.

After a series of long space frame sections were joined, suspended sections were raised into position between cantilever ends to complete the pattern. Falsework beams were removed after completion of the roof over one bay, and then moved to another bay.

A new type of expansion joint was employed in joining end-to-end sections. Instead of the customary bolt-in-slot, this joint used a square bar sliding in a slot. The bolt fits into the bar, rather than into the slot, thus eliminating point contact.

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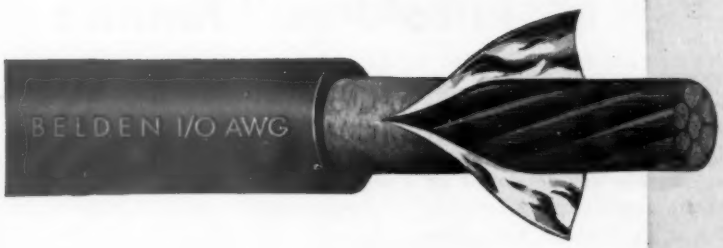

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High voltage-frequency vinyl insulation affords perfect resistance to corona and ozone cracking . . makes this cable ideal for high frequency welding. High resistance to abrasion, oil, and impact.

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Hawser lay construction of conductor makes this cable extremely limp and manageable . . minimizes operator fatigue. Jacket won't pull away from electrode holder. Neoprene insulation.

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VARIOUS shapes and sizes have been brazed by Boeing in cold-wall furnace, which was developed as a result of participating research. Shapes include contoured parts and flat panels with brazed channels, and honeycomb with brazed edge members.

Teamwork spells success in research

The development of the cold-wall brazing furnace (described in adjoining columns) is cited as a good example of results achieved from "participative" research.

This is the technique used by the manufacturing research section of Boeing Airplane Co. in which the entire Wichita plant is employed as a research laboratory. The plan endeavors to make practical use of the skills and experience of the manufacturing and laboratory personnel concerned.

The research work is sandwiched into production schedules without interrupting them. All authorized activity is charged to special accounting numbers.

About 30 specialists, headed by Walter E. Burnham, comprise the manufacturing research section at Wichita. They work in five main units—tooling and metal-working, electronics, chemistry, research application, and metallurgy.

The cold-wall furnace and brazing tests were a project of the metallurgy unit. However, several other groups, including personnel in tool design, in the tooling shop, and in metal bonding, played active roles. They contributed their ideas and helped to build the new unit.

Honeycomb brazed in cold-wall furnace

IMPRESSIVE RESULTS with a new cold-wall furnace have been reported by Boeing Airplane Co. Designed for honeycomb structures, the unit was developed by the firm's manufacturing research section at its Wichita, Kan., division.

The improved furnace has emerged from extensive trials which have demonstrated its flexibility and adaptability, Boeing officials say. They further predict that the new approach will give the firm an important capability in brazing stainless-steel honeycomb for high-speed vehicles of the future. Most of the honeycomb now in use there is metal-bonded aluminum.

In the cold-wall furnace, heating elements are placed next to the structure being brazed. A cooling system is incorporated into the unit. Costly metal envelopes are eliminated.

The furnace gets its name from the fact that its walls remain relatively cool during brazing operations because of re-location of the heat source.

A workpiece is placed on the furnace table, which has a steel base. A portable steel retort is suspended over the work from an overhead track. When lowered, the retort rests on a rubber-like O ring in the base, making an air-tight fit.

The workpiece is surrounded by insulation material, graphite tooling, heating elements, and the heat-exchanger cooling system. The cold-wall retort fits over this assembly, eliminating need for steel envelopes used in conventional furnaces.

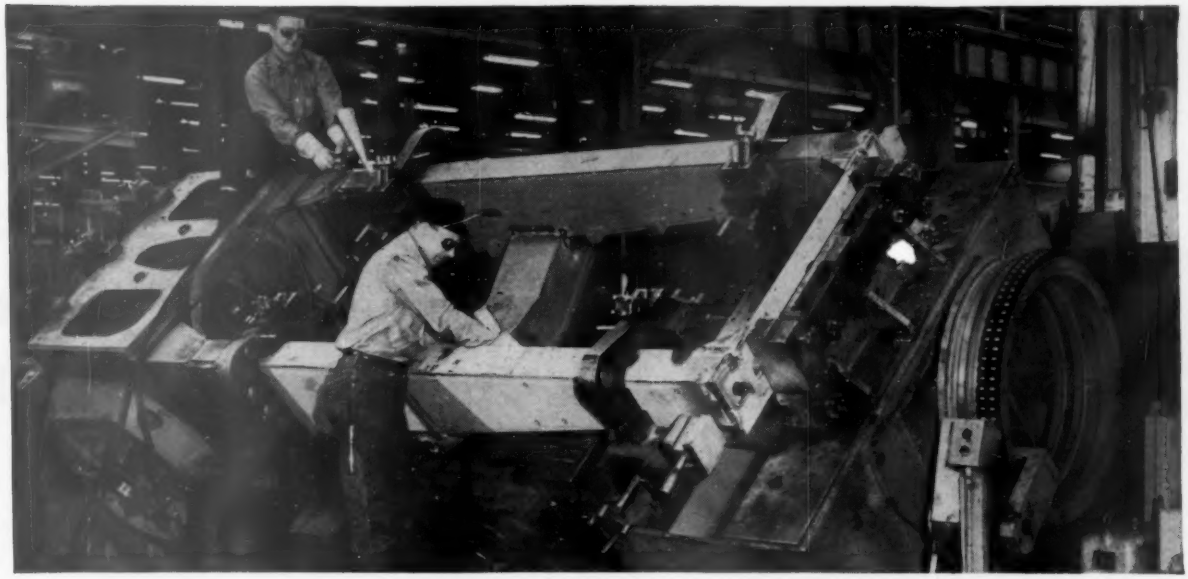
With the retort lowered and the seal completed, air is pumped out to create a near-vacuum. Purging agent, used to reduce oxygen and its contaminating effects, is argon gas.

All supply lines, including electrical lines for heat, are in the fixed base. They are not affected when the retort is lifted clear for loading the next assembly.

Because heat is concentrated where needed, some test panels have required only 21,000 BTU, compared with 1,500,000 BTU needed for similar panels in previous brazing operatons.

Complete cycle for purging, brazing, cooling and unloading is only one-tenth (or less) of the time required before.

By adapting graphite tooling, insulation, and heating and cooling elements to appropriate configurations, honeycomb structures of varied contours (see photo) can be brazed in the new furnace as the retort is also adaptable.



There's more to Welding Wire than the analysis

Particular welding jobs call for particular welding wires—and you might think that one wire is as good as another so long as it has the right chemical analysis. But there's more to it than that.

Take Caterpillar Tractor Co., for example, which is a large consumer of welding material. Just identifying and using the correct analysis isn't enough. Caterpillar also requires efficient packaging and coiling—uniform temper and finish—consistent metallurgical characteristics. In fact, it is at Caterpillar's suggestion that PAGE now color-codes coils for quick identification. Caterpillar uses PAGE welding wire because it meets the requirements—regularly. In your own welding operations, you can count on the same high standards when you specify PAGE.

This tractor is typical of the hard-working, dependable products made by Caterpillar. PAGE **Analysis 8620** is used to obtain high strength welds with maximum ductility on alloy steel.

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When you bring your welding problems to PAGE, you get the benefit of over half a century of wire drawing experience and leadership in metallurgical research. Leadership evidenced by the industry's widest range of analyses —33 grades designed to do an endless variety of welding jobs. Let PAGE help you improve your quality and lower your costs by furnishing the right wire for your job.

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THE LINDE TRADE-MARK PHOTOCELL TRACER

Here is the all new OXWELD CM-56 dual-carriage shape-cutting machine. It can carry more torches over a wider range than other similar sized and even larger machines. The 90-in. model (shown here) carries up to 6 torches; the 120-in. model up to 8 torches; 62-in. model up to 4 torches. A new cross roll drive principle takes the drive wheel completely off the tracing table. All operating controls are grouped on a conveniently located panel.

with built-in kerf adjustment!

Exact size pencil drawings of the most intricate shapes and forms can now be used to guide oxygen shape-cutting machines! Using easy-to-prepare pencil or ink drawings on ordinary paper, you entirely eliminate expensive and bulky templates, photographic negatives and costly silhouettes. And there is no template storage problem. In most shops, savings from the elimination of templates alone will pay for the new tracer in less than a year.

Extreme Accuracy—Tracer accuracy is excellent—within ±0.005 inch. Kerf widths up to ¼ in. are adjusted for on the tracer. Drawings of parts are made in the *exact size* of the piece desired. They can even be traced directly from engineering drawings! With LINDE's unique kerf adjustment, one simple line drawing can be used to reproduce the same shape in different plate thicknesses.

Speed is controlled by an efficient eddy-current governor that provides smooth, stepless speed control over a range adjustable from 2 to 30 in. per minute. The tracer can negotiate 90° turns with 1/16″ radius at average cutting speeds. Models of the new tracer are available for use with all OXWELD machines and most competitive machines.

Tracer not affected by ambient light—The Tracer may be located indoors or outdoors without regard for lighting conditions. Ordinary light or sunlight does not interfere with the precision operation of the tracer. An operator can use as much light as he needs to follow the cutting operation without fear of upsetting the cutting pattern. He can steer manually or use remote control buttons.

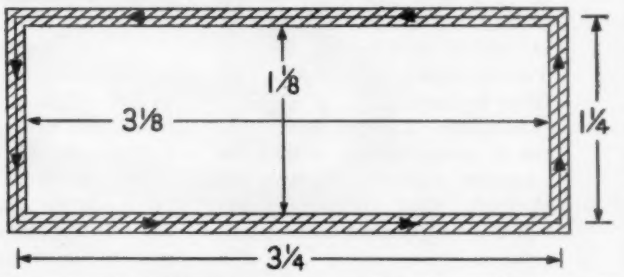
Get full details on the new LINDE Photocell Tracer and the OXWELD CM-56 shape-cutting machine from your local LINDE office. Or, write Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Linde Company, Division of Union Carbide Canada Limited, Toronto.

LINDE COMPANY UNION CARBIDE

WHAT KERF ADJUSTMENT MEANS TO YOU:

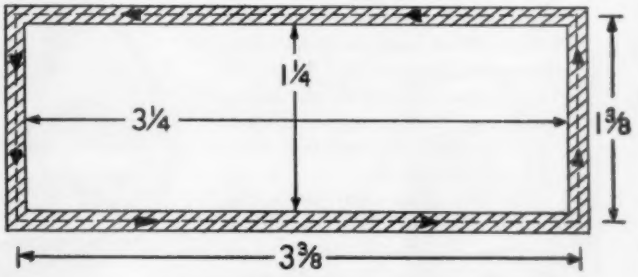
Cutting without kerf adjustment

Path of torch guided by a tracer without kerf adjustment following a 1¼″ by 3¼″ drawing. Assuming the kerf width is ⅛″ the actual part produced measures only 1⅛″ by 3⅛″ even though the torch (arrows) faithfully follows 1¼″ by 3¼″ drawing.



Cutting with kerf adjustment

Path of a torch guided by LINDE Photocell Tracer with kerf adjustment following a 1¼″ by 3¼″ drawing. With the kerf adjustment set for the ⅛″ kerf the torch (arrows) will follow a path 1/16″ around the outside of the 1¼″ by 3¼″ drawing of the part. Actual shape produced measures 1¼″ by 3¼″—exactly the same as the drawing.



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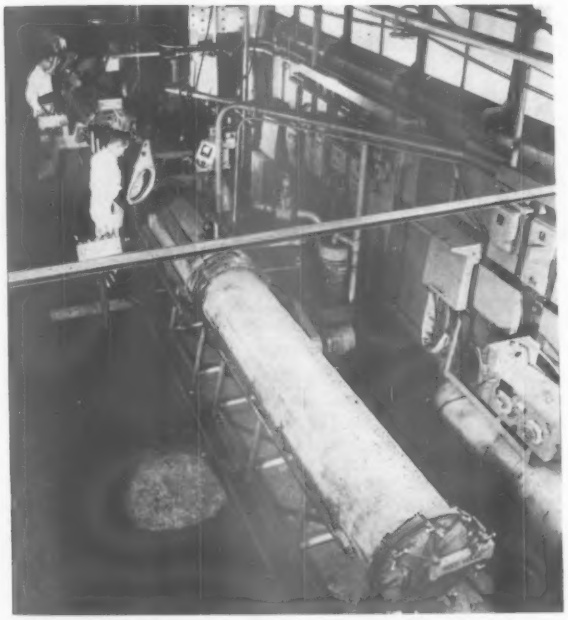
Zirconium alloy tubes improve reactor design



WELDS were made in specially designed 40-ft long dry box completely outfitted with two separate welding systems. Zircaloy-2 was joined by Tig process.

PRESSURE TUBES of Zircaloy-2, in lengths never before achieved, have made possible a new concept in nuclear production reactors.

Fuel elements will be inserted into these welded tubes, rather than in one big pressure vessel, for a reactor now being built at Hanford Works, Richland, Wash.

The zirconum alloy was chosen because of its low neutron absorption and its high corrosion resistance to water at elevated temperatures.

Three firms cooperated in the venture to produce the large-diameter tubes which measure 57 ft in length and weigh 425 lb.

Allegheny Ludlum Steel Corp. extruded the tubes in three sections, to an approximate length of 14 ft each. The Budd Co. Tig welded the sections in an inert-atmosphere chamber, or dry box. Tube Reducing Corp. reduced the tubes to finish size.

Allegheny Ludlum compacted the zirconium sponge, welded the compacts together to form an electrode, then melted it into ingots by its vacuum-melting process.

After various testing procedures, ingots were forged into 8-in. squares and later rolled into 7-in. billets. These were sonic tested to determine high quality. Machined to extrusion dimensions, the billets were then clad in copper to prevent contact between the alloy and extrusion tools.

The extrusions were just under 4 in. in diameter. They were then straightened, after which the copper was removed by pickling in nitric acid. Bright pickling followed in a nitric-hydrofluoric acid solution.

At this point, more critical tests were made, including a check for dimensional accuracy.

At Budd, the tubes were matched in sets of three. Ends were bright pickled and prepared for welding. A mandrel, especially designed for the job, accurately located the tubes during welding.

The finish Tig weld was made in the dry box, which was outfitted with two complete welding systems assembled specifically for joining the Zircaloy-2 tubes. Tooling inside the chamber, and ways and rotating mechanism were also of a special design.

EXTRUDED tubes of zirconium alloy as seen through porthole of inert chamber. Note air-cooled Tig torch.

The precise quality control continued as welds underwent careful testing. Radiographic inspections determined porosity-free welds and complete penetration. Other tests determined hardness and corrosion resistance.

At this stage, the tubes were about 40 ft long. They were then shipped to Tube Reducing Corp., where they were "rocked" to specified length and wall thickness.

Final tests on the completed tubes included hydrostatic and pneumatic pressure checks and a series of tests to assure adherence to specifications: OD, ID, wall thickness, straightness, corrosion and chemistry. Concurrent testing was conducted by General Electric Co., operator of the Hanford installation for the Atomic Energy Commission. G-E is directing construction of the new reactor.

Finish dimensions of the Zircaloy-2 tubes were 3¼ in. OD, with a ¼-in. wall and minimum length of 57 ft. Straightness varied less than ¾ in. in this entire length. Tube surface was free of pits, cracks and laminations, with a surface roughness of 63 micro-inches.

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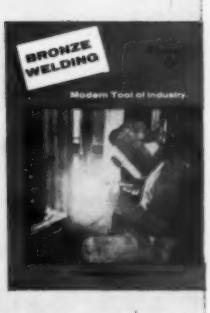

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Here's how it's done . . .

Quenchable deposits speed cast-iron repair

SPEED IS THE PRIMARY advantage claimed for a new cast-iron welding process in which deposits can be quenched without danger of cracking.

Preheating and slow cooling necessary in most conventional methods have been eliminated, allowing most jobs to be finished in one-tenth the time previously necessary.

Other advantages claimed for the Quench Weld process just introduced by Eutectic Welding Alloys Corp., Flushing, N. Y., include:

—Elimination of peening;

—Absence of toxic fumes.

The manufacturer predicts that elimination of excessive heat through quenching will make possible repairs usually not attempted. Salvageable pieces will increase from the present 20% of cracked or otherwise damaged castings to almost 100%, is a further estimate.

The process is recommended for most cast irons. But it cannot be used on chilled iron, Ni-Hard and similar materials, as these base metals would themselves crack during quenching.

Applications include repair of cracked or broken castings, filling of blowholes and machining errors, build-up of worn or broken gear teeth, and—outside the vale of repairs—joining cast iron to itself and to steel.

A further advantage claimed is that permanent, in-place repairs on machine bases, columns and similar stationary items are possible.

Key to the three-step application is a new a-c/d-c electrode, QuenchTrode 24, which provides a deposit low in carbon, alloyed with grain-refining elements. Deposits are machineable and have the necessary toughness to resist cracking during accelerated cooling.

The three steps in the process are aimed at combatting the three chief causes of cracking in cast-iron welds:

—Stress concentration;

—Contamination of the weld; and

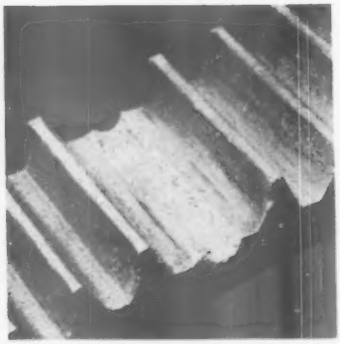
—Stresses exceeding weld-metal strength because of cooling.

The welding procedure:

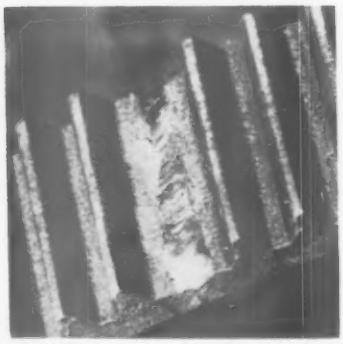
1. The area to be welded is veed out with a chamfering electrode, which is also used to make grooves to break up stress concentration around the vee.

2. The grooves and entire weld area are coated with a thin deposit of a sealing-type electrode, preparing the surface for a strong bond between the cast iron and final deposits, thus damming off contaminants.

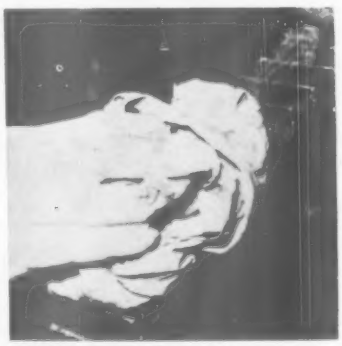
3. The QuenchTrode electrode is used in back-step welding with beads of 1 to 4 in., depending on section thickness. Each pass is quenched as soon as the arc is broken, and the next pass may be made immediately. Water ordinarily is the quenching agent, but air blasts may be utilized, in which case peening is recommended but is not essential.



WORN or broken gear tooth is removed by chamfering, leaving anti-stress groove.



GROOVE is filled and weld area tinned with sealing deposit to dam contaminants.



DEPOSIT is quenched with wet rag immediately after arc is broken. Air blast or water stream can be used.

READY for machining, gear tooth shows built-up deposit made with new cast-iron electrode.

Make Smooth Deposits – Fast with Mechanized Hard-Facing

Hard facing on a mass scale

This HAYNES Hard-Facing Machine faces 1000 hammers a day—a typical mass production story when mechanized methods are used.

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Exceptionally smooth, uniform deposits cut subsequent machining time and lengthen tool life. Less alloy is used. There are fewer rejects because deposits conform more closely to specified requirements. Proper preheat, correct proportioning of the multiple welding flames, and a continuous supply of molten metal are maintained.

These are a few of the reasons why it will pay you to look into HAYNES Hard-Facing Machines. Our field engineers can help you determine which of your hard-facing jobs are suitable for mechanization. For full information on HAYNES Mechanized Hard-Facing Machines and on the wide range of HAYNES Hard-Facing Alloys, write our general sales office in Kokomo, Ind.

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The terms "Haynes" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

ONE of the later steps in production of washing machine cabinets is this dual strut welder, shown from the entry side.

Automated welding speeds production of laundry cabinets

RESISTANCE WELDING lines for production of consumer goods are becoming more sophisticated as automation continues to be industry's answer to rising costs.

Welders and associated metal-forming machines made by Taylor-Winfield Corp., Warren, Ohio, are currently turning out home washing machine cabinets at the rate of 300 per hour.

An automatic line destacks the metal sheet and blanks, punches, flanges, U-bends, embosses and spot welds corner gussets, top braces, and struts—all mechanically fed into position.

Material is fed into the line by an electro-magnet destacker, which lifts and turns the sheet. The next station incorporates a centering device and a sensing mechanism to assure that just one sheet of material is being fed into a 300-ton punching and notching machine.

This machine trims both ends, notches the four radius bending areas and pierces holes and slots. After two more idle stations, the sheet is moved to another puncher and notcher where it is flanged all around.

From the next idle station, the material is moved to a special post-tangent bender. The upper ram tooling is mounted to the crown member of the machine and the lower clamp and rocker dies to the moving member for the wing-forming operation.

The next station, after another idle position, is a special hydraulic forming machine for shaping the top in-bent flanges, corner embossments and back flange bracket hose support.

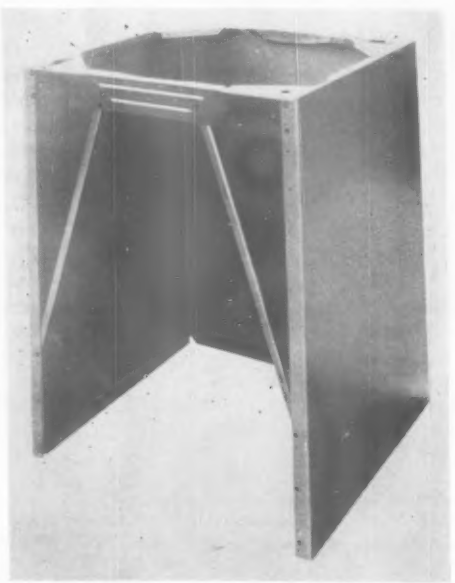
Then the cabinet is lowered from the transfer level, rotated 90 deg, and again raised to the transfer level. The work piece is fed into the top brace welder, where the top brace is assembled and spot welded to the cabinet. An air operated escapement type magazine automatically feeds and loads the top brace.

Again through the idle station, the cabinet moves on to a gusset welder. Corner brackets, or gussets, are arranged in the magazine. They are automatically loaded into a carry-in device, which receives the brackets on a horizontal plane and raises them through 90 deg to place them in the welding position.

Each corner is welded with a cluster of six spot welding guns. When this welding is finished, the cabinet moves into the rear flange piercing machine. Here the cabinet shell is elevated from the transfer line into operating position. Ten holes are pierced in the rear flange and the cabinet returned to the transfer elevation.

After idling, the cabinet goes to a special strut welder with magazine feed and air escapement of the struts, arranged to weld both struts at the same time. An inner welding mandrel is arranged to expand after it enters the cabinet shell from the side.

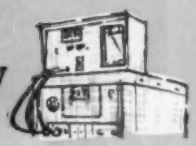
This mandrel, which moves horizontally, carries the struts into the welding position. An elevator lowers the cabinet onto the mandrel. Finally, the completed cabinet assembly is discharged from the transfer conveyor.



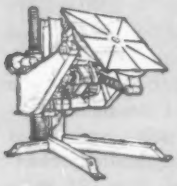
APPEARANCE of finished product indicates the many forming and welding processes it has been through during production cycle.

If profitable arc-welding is important to you, then you ought to investigate the complete line of modern Harnischfeger

equipment. For example, P&H weld-programming with motorized rheostat or sequence-timers enables you to weld Space Age and other super-critical metal automatically! Or you can automate your welding with P&H punched-tape control. Both are infinitely versatile and standardize weld quality at levels



impossible with manual controls. P&H also offers you industry's most complete line of industrial welders — 1 to 750 amps. — AC, DC, or dual AC/DC machines with h-f, spot gun, and gas and water controls. And P&H engine-driven welders give you compact, self-contained 25- to 500-amp. weld-power for field jobs. The different types of P&H electrodes enable you to match the



analysis and properties of many weldable parent metals. And you can cut welding labor and overhead costs in half with P&H welding positioners. So...

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CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

Furniture firm adopts liquid flux, boosts production

ADOPTION of a new method of brazing steel tubing joints dropped costs by 10% and reduced rejects to a negligible figure for a southwestern funiture manufacturer.

Griggs Equipment, Inc., Belton, Texas, producer of metal and wood furniture for school, church, and auditorium seating, was faced with the problem of excessive build-up on joints from the flux-coated bronze rod in use.

On the recommendation of Alamo Welding Supply Co., Austin, Texas, Griggs set up a test bench to try a bare bronze welding rod with a liquid flux fed automatically through a dispensing unit and premixed with acetylene to the flame.

Results of the flux system, supplied by All-State Welding Alloys Co., Inc., White Plains, N. Y., were observed over a 60-day period.

An improvement in weld quality was noticed immediately. Finished joints were smooth with strength equal to, or better than, joints made with coated rods. Filler metal flowed faster around joints, and less of it was required. In addition, rejected units dropped from 2% to a negligible amount.

The combination of faster, cleaner flow and absence of rejects has

LIQUID flux used in joining of steel tubing increases flow of filler metal into joint, and cuts the amount of rod needed for sound welds.

resulted in 10% increase in production for Griggs. Satisfaction with these results caused the firm to adopt the system on the entire production line four years ago.

The firm attributes its expansion – 50 weldors now working on its production line – to the liquid flux method.

THESE ARE EXTRAORDINARY FLUXES

The correct selection of flux can offer unexpected help in speeding and simplifying production, minimizing rejects and lowering costs in low temperature silver brazing operations. The advantages to be gained by "selective fluxing" are *sufficiently important to warrant careful, thorough study!*

Silvaloy offers the most advanced flux developments in this specialized field. Here, is *a complete line of fluxes* . . . each providing outstanding performance, enabling you to select the correct flux for every possible low temperature brazing operation. The extra efficiency of Silvaloy "Selective Fluxing" is being proved daily on the brazing production lines of the country's leading manufacturers.

Call the Silvaloy distributor in your area for consultation and detailed information or, send for our booklet "A Complete Guide to Selective Fluxing for Low Temperature Silver Brazing."

Silvaloy fluxes are packaged in 65-lb. and 30-lb. drums, 5-lb. wide mouth jars (5 to a carton), 1-lb. and ½-lb. jars. The wide opening of the 5-lb. package makes it a most practical, time saving dispenser that also enables the operator to make use of every bit of flux in the jar.

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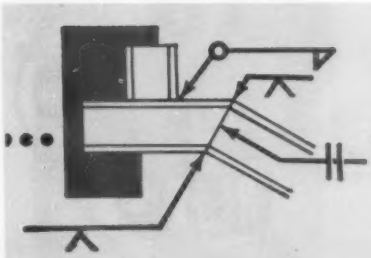

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Four important brazing processes

Question:

Could you give me some information on those brazing methods which are now being used extensively?

Answer:

Although there are eight basic brazing methods listed in the AWS master chart of welding processes, only four are of commercial importance at present; torch, induction, furnace and dip brazing.

(Those which have lost headway in the brazing field for one reason or another are resistance, twin-carbon arc, block and flow brazing.)

Of the four commercially important methods, torch brazing is the most popular, although the other three are used equally as much, depending on application.

Torch brazing is generally manual, but torches can be set up to move past a line of parts to be brazed—or handle a number of parts carried through the torch flames.

Tips used in this method can be the welding type with a single orifice or larger in diameter with several orifices to permit more general flame distribution.

A variety of gases can be used, although an oxyacetylene mixture is the most popular. Among these gases are oxyhydrogen, oxypropane, oxygen or air and city gas, and compressed air and city gas.

Absorption of heat energy by parts placed close to an a-c coil characterizes the induction brazing method. Parts being brazed, however, are not a part of the circuit.

Necessary electrical power for this method can be obtained from a vacuum-tube oscillator, spark-gap or motor generator unit. Each of these provides a specific current frequency range (from 10,000 cycles for motor generators up to 5,000,000 for a vacuum-tube oscillator.)

A lower frequency rate, such as provided by a motor generator, leads to deeper heating of the work-piece. However, fit-up problems plus more economical power from other sources producing comparable frequencies, has led to a decreased use of this method.

Spark-gap equipment requires continual maintenance which increases costs wherever used. So the most efficient, and popular, of the three is the vacuum-tube oscillator.

Its frequencies provide effective heat for both ferrous and non-ferrous metals to be brazed. It also provides good heat distribution, accurate heat control, uniform results and speed. This process does, however, commit the user to a specific set of brazing conditions and to closer attention to joint design than necessary in simpler, more flexible equipment.

Furnace brazing, like induction brazing, is valuable when repetitive production is demanded. Gas, electricity or oil can be used to fire the four basic types of brazing furnaces: box, retort, conveyor and bell.

Parts placed in any of these are normally fluxed unless a protective or controlled atmosphere is used (and even then a small amount of flux may be necessary).

Of the four, only the conveyor handles parts on a straight-through basis. The other three are known as batch types. Recently developed conveyor furnaces have both heating and cooling chambers, and other furnace types have also been modified so that controlled cooling can become an integral part of the brazing operation.

Dip brazing is so called because parts are jigged and placed in a chemical or molten metal bath which is maintained at a correct brazing temperature. The alloy is preplaced on parts in both types.

For molten metal dip brazing, refractory bricks or graphite form the crucible containing the metal. A cover of flux is placed over the top of the molten metal mass, and the parts must be fluxed after a thorough cleaning.

Parts to be brazed by either method must often be preheated, then moved quickly to the bath before any excessive heat loss can occur. After immersion and the brazing operation is complete, flux removal operations begin immediately.

By any standards, today's manual and automatic brazing processes are doing a man-sized job. Without them, jet aircraft, automobiles, household appliances and metal furniture would be bulkier, costlier and less streamlined.

HIGH value at low cost! With the only authoritative economic report on 1959 industry sales figures, a bibliography of top welding articles appearing in *WELDING ENGINEER* during the past twelve months, and the most complete listings of products, manufacturers and tradenames, *FACT FILE* has year-long priority on the desks of most of its 25,000 readers. This means sales messages in *FACT FILE* are continually selling. Yet the cost is so low! Your regular earned rate applies for *FACT FILE* (but this issue doesn't contribute towards the earned rate.)

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WIDE coverage of "Build-up and Overlay by Welding," with much heretofore unpublished material on the subject, will make this issue a valuable handbook to many people. This feature assures lasting life for the 1960 *FACT FILE* — and lasting exposure for its advertisements.

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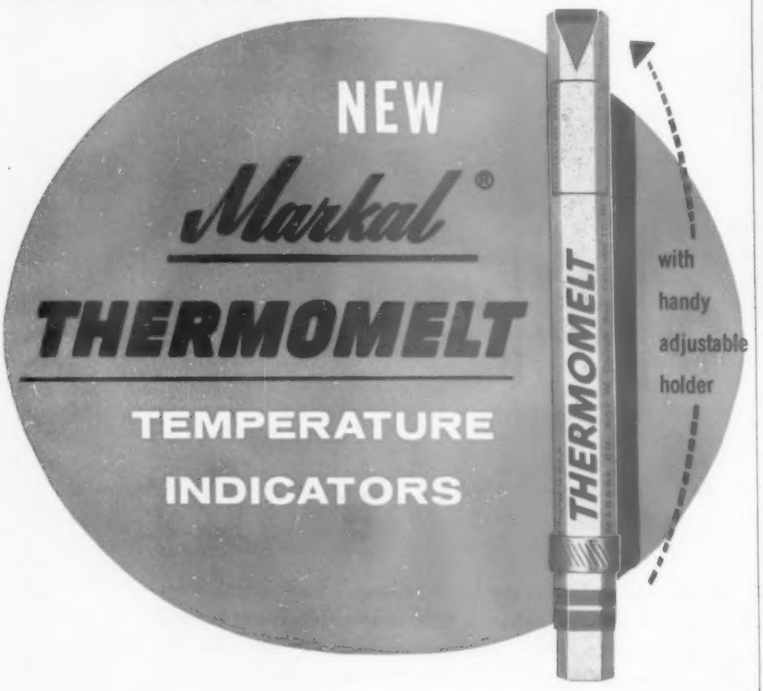

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Mig welding reduces production time 70%

SAVINGS OF NEARLY 70% in production time are being realized by Precision Sheet Metal, Inc., Los Angeles, in its fabrication of aluminum shipping containers.

The company recently replaced manual arc welding with an automatic Mig process manufactured

CIRCUMFERENTIAL weld is being completed on 3/16-in. aluminum angle extrusion.

by Linde Co., New York City.

For this application, circumferential welds are made in 6061 aluminum at the top of the container — an angle extrusion 3/16-in. thick — and in 0.090-in. thick aluminum to join the shell to the container's bottom.

A standard portable welding machine is used with a hand torch in a stationary mounting. The machine is mounted on a 300-amp constant potential power supply set on a low scale. An automatic turning device rotates the aluminum workpiece.

The 3/16-in. weld for the angle extrusion at the top of the assembly

BOTTOM of shipping container is welded to aluminum shell.

is made using 3/64-in. diameter aluminum wire while the weld joining bottom and shell is made with 0.030 almuinum wire. Pure argon protects the weld area.

NOW, WATER-COOLED WELDING! What! Water quench cast iron? Never, according to conventional theory. But now, our extensive field research brings you new QuenchTrode* 24 and a quick-quench, no-pre-heat process. Result: permanent cast iron repairs. With this discovery, and simple application techniques, you can weld cast iron in as little as 1/10 of the usual time. No special equipment needed.

For details, case history, turn page.

Low Temperature EUTECTIC WELDING ALLOYS

*Patent Pending

NEVER SAY "CAN'T WELD IT"... Case in point: Midwest shop was given a broken cast iron oil sump to repair. Conventional weld attempts failed due to oil and crack-sensitivity. Porosity and voids resulted. Then they called in Eutectic. Our man-on-the-spot prescribed the cure: our trouble-shooting trio of ChamferTrode®, EutecTrode® 27, and QuenchTrode* 24. Watch them!

1. Weldor vees out area with ChamferTrode, and makes grooves in side of vee to relieve stress.

2. Now he "paints" over entire vee surface with EutecTrode 27, filling grooves as he goes. EutecTrode 27 bonds to the oiliest surface, gives base for joining.

3. Final step: weldor makes joint with QuenchTrode 24, using stringer passes and cold-to-hot back-step method. He quenches with wet rag after each pass, till complete fill is made.

RESULT: A strong, permanent, machinable weld, in a fraction of the usual time. No distortion, stress, or cracking. NOTE: the "Quench Weld" process is equally effective for building up missing metal sections or joining steel to cast iron. This is but one example of how Eutectic helps you.

For the finest in quality products, always turn to Eutectic. Service, on the job, any time, anywhere.

O.K., Eutectic, Prove It!
I want a demonstration of the Quench Weld Process.

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Liquid to gas equivalents

GALLONS OF LIQUID at sea level pressure	Approximate Number Of 244 SCF Oxygen Cylinders	STANDARD CUBIC FEET of GAS at 70° F, sea level pressure		
		Oxygen	Nitrogen	Argon
1	½	115.6	92.9	113.2
10	5	1,156	929	1,132
20	9	2,312	1,858	2,264
30	14	3,468	2,787	3,396
40	19	4,624	3,716	4,528
50	24	5,780	4,645	5,660
60	28	6,936	5,574	6,792
70	33	8,092	6,503	7,924
80	38	9,248	7,432	9,056
90	43	10,404	8,361	10,188
100	47	11,560	9,290	11,320
150	71	17,340	13,935	16,980
200	95	23,120	18,580	22,640
300	142	34,680	27,870	33,960
400	190	46,240	37,160	45,280
500	237	57,800	46,450	56,600
600	284	69,360	55,740	67,920
700	332	80,920	65,030	79,240
800	379	92,480	74,320	90,560
900	426	104,040	83,610	101,880
1000	474	115,600	92,900	113,200
1200	569	138,720	111,400	135,840
1500	711	173,400	139,350	169,800
2000	948	231,200	185,800	226,400
2500	1184	289,000	232,250	283,000
3000	1421	346,800	278,700	339,600
5000	2369	578,000	464,500	566,000

Chart courtesy of Ronan & Kunzl, Inc.

The difference in volume of oxygen, for example, as a liquid and as a gas at normal temperature and pressure (70 F and 14.7 lb per sq in. absolute) is 862 to 1.

Boiling points

	C	F	K	R
Oxygen	—183.0	—297.4	90.1	162.2
Nitrogen	—195.8	—320.4	77.3	139.1
Argon	—185.7	—302.3	87.4	157.3

$C = 5/9\ (F - 32)$ $F = 9/5\ (C) + 32$ $0°K = -273.19\ C$

Passes drop tests

Welded aluminum raft gets Coast Guard approval

WELDING PLAYED an important part in the fabrication of the first all-aluminum, twin hulled life raft to be approved by the U. S. Coast Guard, and now in service on the Great Lakes.

Constructed entirely of aluminum supplied by Aluminum Co. of America, Pittsburgh, the craft was Mig-welded on a semiautomatic basis employing 1/16-in. aluminum wire. Current setting for the work was 200 amps at 18 volts, with a rectifier power source.

Bulwarks of the catamaran-type raft are made of 5-in. channels in alloy 6061-T6; frame members of 3-in. channels are in the same alloy. Decking is made of 10-gage channel in 5052-H32 aluminum, and lockers and air tanks are 3003-H14 sheet.

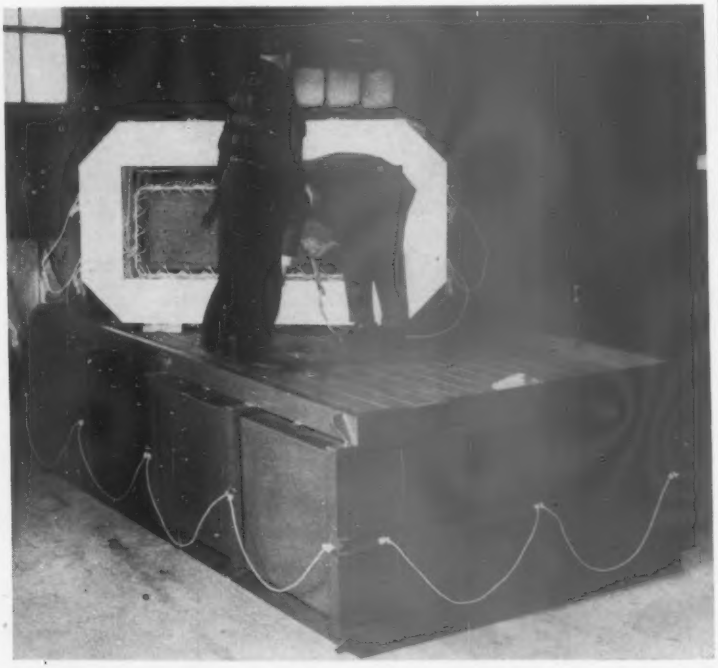
Only one pass was required for joining, with a wire speed of 12 ft per minute. Fifty cubic feet of argon were consumed in the operation. The finished product was found to possess both high strength and good stability necessary for efficient performance.

A series of exacting drop, freeboard and stability tests, supervized by U. S. Coast Guard personnel, proved the overall merit and inherent structural strength of the new design.

These aluminum rafts are claimed to make possible substantial savings for ship operators by virtue of their lighter weight and ease of maintenance.

Two aluminum tanks, filled with styrofoam blocks, provide buoyancy for each of the new rafts. Should the tanks be damaged or punctured by debris, their buoyancy will not be affected.

The construction was done by Welin Davit and Boat Division of Continental Copper and Steel Industries, Inc., Perth Amboy, N. J., which is working on designs for catamaran aluminum rafts in additional sizes.



DESIGNED to accommodate up to 25 persons, all-aluminum raft was Mig-welded.

FREE DEMONSTRATION

Talk to your nearest RANSOME distributor about an automation package. Any of the RANSOME distributors listed below can arrange a free demonstration for you.

ALABAMA
Ebbert & Kirkman Co., Inc.—BIRMINGHAM
CALIFORNIA
Anderson Equipment Co.—LOS ANGELES
W. H. Douthitt Steel & Supply—EL CENTRO
Heidt Equiment Co.—OAKLAND
Moore's Welding Supply—SACRAMENTO
G. S. Parsons Co.—SAN DIEGO
A. G. Pond Co.—SAN JOSE
CONNECTICUT
Zane Weldcraft Supplies, Inc.—HARTFORD
FLORIDA
Duval Welding Supply Co.—JACKSONVILLE
General Welding Supply Co.—TAMPA
Kennerk Welding Supply Co.—MIAMI
GEORGIA
Keenan Welding Supply—ALBANY
Pye-Barker Welding Supply Co.—ATLANTA
Savannah Oxygen & Supply Co.—SAVANNAH
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A. E. Dailey Co.—MOLINE
Machinery & Welder Corp.—CHICAGO
INDIANA
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OKLAHOMA: Oklahoma Oxygen Co.—TULSA
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*A typical package of the 3 pieces of Ransome equipment you'll need is illustrated here. The Model 25 Positioner ($1885) will handle sub-assembly work up to 2500 lbs. The Model 66 Manipulator ($2560) will allow girth welds up to 8 feet in diameter and longitudinal weldments up to 6 feet. Both the positioner and the manipulator give you accuracy to ±1%. Ransome's Model A Power and Idler Rolls ($1405) easily handle vessels up to 4 to 5 tons. Add your power source and welding head and you're automated. Of course there are other combinations to fit your own requirements . . . let Ransome demonstrate how inexpensive automation can be.

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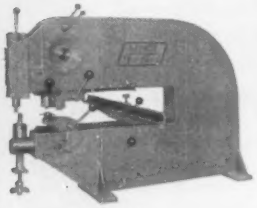

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SERVICE engineer Howard Stauffer and welder Orville Schumacher of Prince Mfg. Co. inspect crack in base of drill press, now filled with nickel-cored cast iron alloy.

Welding saves $1,000 in repair of drill press

SAVINGS OF more than $1,000 were realized by an Iowa manufacturer when welding went to work in repairing a large drill press.

Prince Mfg. Co., Sioux City, Iowa, was unloading a five-ton drill press from a semi-trailer truck. A cable snapped, barely missing two men and shattering the truck's windshield. The drill press dropped four feet to the concrete loading dock, cracking the inch-thick iron base for 22 ft.

Molds and recastings of a new base would cost $1,300 and delay production for days. The press itself was not damaged but the crack rendered the machine useless.

Early efforts to obtain service gave the firm little encouragement. There was no base for that model press in stock at the manufacturer's warehouse, so a new one would have to be cast. It would be weeks before molds could be made, a casting poured and the new base machined and delivered.

A local call was made to the Monroe Welding Supply Co. Within half an hour Howard Stauffer, Monroe's service engineer, was inspecting the crack. Stauffer told Prince officials he thought the base could be made as strong and serviceable as before.

The problem as he saw it was to use a welding rod that would penetrate the cast iron yet not set up stress in the casting.

His recommendation for the root pass was the ESt non-machinable electrode for cast iron, manufactured by All-State Welding Alloys, Co., Inc., White Plains, N. Y.

Stauffer's second recommendation was ENi, a nickel-cored electrode for cast iron with free machinability and good color match.

The first pass was skip welded with a ⅛-in. ESt electrode, using 125 amps. This served to penetrate the parent metal and join the broken casting into a complete base. Final step was to groove and fill in the remaining crack with the ENi electrode to provide the necessary ductility.

Extreme caution prevented overheating. The two electrodes selected provided the right combination of strength and ductility, and the drill press, in constant operation since, has withstood rugged use without further problems. Complete cost for time and materials was $216 — a saving of better than $1,000 compared with the cost of a new base.

AROUND

General Cable's rubber-insulated welding cable is so flexible you can run it almost anywhere. It provides excellent resistance to abrasion, twisting, impact, heat, moisture and weather. Our neoprene-insulated welding cable extends this durability by also resisting flame and oil. And for really heavy-duty use, our Super Service welding cable combines unusually-fine strand construction with a heavy-duty, mold-cured neoprene insulation-jacket. This Super Service type complies fully with all of the applicable IPCEA standards. General Cable also manufactures a superior Welder Power Supply Cable to complement its regular line of welding cables. Call your authorized General Cable Distributor for full information.

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S-42 Chippers Goggle with flat, or 6:00D Bal-SAFE lenses, clear or in Ray-Ban shades 1, 2 or 3.

W-35 Chippers Eyeshield with two Enduron 2"x4¼" plates; gives increased protection and provides air space which further reduces fogging.

S-41 Welders Goggle with Arc-Ban lenses in shades No. 3 through No. 6, with tough Enduron plastic cover lenses.

W-36 Welders Eyeshields with 2"x4¼" Arc-Ban welding plate, shades No. 3 through No. 6, with Enduron cover plate.

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Insure workers a greater degree of safety than ever before; give them more comfort, better vision. Insure more worker cooperation, too, because these goggles and eyeshields are so good looking in their new opaque flesh color and bright nickel louvers, vents and head bars!

Soft and flexible, they fit snugly, comfortably. Eyeshield plates are replaced in seconds through side opening. Goggle head bars are adjustable as are two-tone elastic headbands. For more details, prices, write today: Bausch & Lomb Optical Co., 98705 Lomb Park, Rochester 2, New York.

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Book Reviews

Ferrous welding

WELDING FERROUS MATERIALS FOR NUCLEAR POWER PIPING. Prepared by American Welding Society committee, New York City, 1959. 14 pages, $1.50.

This report, the first national publication on welding of ferrous materials for nuclear power piping operations, was compiled by nuclear power experts and represents their combined knowledge of the best methods and procedures to be used in this industry.

Covered are such topics as root pass welding, including discussion of procedures and joint preparation, and selection of correct welding procedure; fabrication quality control and acceptance inspection; and weldor performance. Several line drawings illustrate the subject matter.

Indexing systems

BIBLIOGRAPHY OF FILING, CLASSIFICATION, AND INDEX SYSTEMS FOR ENGINEERING OFFICES AND LIBRARIES. Compiled by the Engineering Societies Library, New York City, 1960. 33 pages. $2.00.

Prepared to aid engineers and librarians concerned with organizing their own files or files of engineering offices or libraries where they work, this bibliography contains more than 150 references on filing, classification, and other aspects of technical documentation.

Safety code

AMERICAN STANDARD SAFETY CODE FOR HEAD, EYE, AND RESPIRATORY PROTECTION. Sponsored by the Department of the Navy, National Bureau of Standards, and U. S. Bureau of Mines. Published by American Standards Association, Inc. New York City, 1960. 46 pages.

Published as a guide to aid the manufacturer, the consumer, and the general public, the Standard Code sets forth specifications for goggles, spectacles, helmets and hats, lenses, respirators, and other protective devices used in industry. It includes a section defining these various instruments, goes on to make detailed recommendations. Included are tables listing transmittances and tolerances of various shades of filter lenses, and comparative hat and cap sizes.

Chipping anchor wears 100% longer when hard-faced with Inco-Hard "1"...

This 6-foot high chipping anchor is used at a smelter in Ontario, Canada, to remove slag from hot converters. The 2,000 lb steel anchor is lifted by a crane, lowered into the mouth of a converter and positioned beneath the slag crust. One of the three prongs then engages the crust and pulls it away as the crane hoist is raised.

It's a tough, abrasive, service that quickly wears away the anchor's tips. But, using Inco-Hard* "1" electrodes for hard facing, doubles service life. All five of the chipping anchors used at the smelter are tipped with ¼-inch deposits of this weld metal to increase service life.

Hard-facing pays

With performance like this, it's very economical to "armor" critical wear points on slag-chipping anchors... or to reface such points when worn down in service. Mixer blades, bucket lips, wearing plates and dredge spud points are typical of the many applications where hard-facing with Inco-Hard "1" electrodes is the inexpensive way to extend service life.

Hardness comes easy

Despite the high hardness developed by Inco-Hard "1" electrode, the deposit is easy to make. With either AC or DC, you get a stable, spray-type arc in all positions with a minimum of spatter. "Wash" is excellent, slag removal good. Deposition rate is high with excellent control over bead contour and size . . . so smooth that grinding is seldom needed.

For more details, for information as to how you can get a free sample, write for our new 6-page brochure, "Inco-Hard '1' Electrode for Hard-surfacing . . .". *Inco trademark

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From Battelle

Research develops low-temperature bonds, new flux

METAL-JOINING specialists at Battelle Memorial Institute, Columbus, Ohio, have reported new advances in diffusion welding and in fluxes for submerged-arc welding.

Excellent bonds at temperatures as low as 650 F are now possible in diffusion welding dissimilar metals, according to D. C. Martin, welding technologist at the research center. The method makes use of one or more intermediate metals to join base materials.

Battelle used metals that can be applied by plating. These intermediate metals make it possible to make joints at temperatures far below those which would be required if two pieces of base material were pressure bonded directly to each other.

Diffusion welding or bonding processes have been applied to a number of problems at the Institute. One was in developing a method for making a throat block for a high-speed wind tunnel. The block itself was made of Monel and had cooling grooves cut in its surface. A sheet of beryllium copper had to be attached to this surface to cover the grooves.

While brazing could have been used, it would present problems when heat treating the copper sheet to bring it up to required strength levels.

The solution:

Using copper and silver intermediate materials, and getting excellent bonds at 650 F, the age-hardening temperature for the beryllium copper.

Not only did this method achieve the required strength in the cover sheet; it also avoided distortion encountered when brazing.

In other applications, diffusion-bonded parts have been used at heat levels well above the bonding temperature.

The submerged-arc flux developed by Battelle is for use in

welding high-strength structural steel plates for submarine hulls. This experimental flux resulted from an extensive program authorized by the U. S. Navy's Bureau of Ships.

High-oxygen content and numerous silicate inclusions in submerged-arc welds on HY-80 structural steel prepared in shipyards pointed to the need for a new flux, according to Perry J. Rieppel, chief of Battelle's Metals Joining Division.

After some study, technologists developed a flux with less acid than others now in use, since it contains relatively little silica and an exceptionally large amount of calcium oxide.

Welds made with the flux and commercial wire had yield strengths up to 90,000 psi, ultimate strength of 100,000 psi, excellent tensile ductility, and notch impact values of 30 ft-lb at −100 F.

The improvements is in the notch toughness of the welds, since previous welds of comparable yield and ultimate strengths had notch impact values of only 10 to 15 ft-lb at —100 F. Battelle reports an equally striking improvement in notch bar behavior at room temperature.

Plans call for evaluation of the flux under semi-production conditions. Lower production costs are forecast as a result of this research. For much of the welding on hulls has been with the manual process using coated electrodes.

"Why are they counting backwards over the loudspeaker?"

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Author Ronay promises to dispel confusion about polarity and penetration

In March, WE published an article by Bela Ronay, welding consultant, on "The importance of polarity in arc welding." In it the author stated that "Depth of penetration under straight polarity is almost twice that of reverse polarity . . ." This prompted several notes from our readers—two of which follow:

Sir:

We in the welding department at the University of Wisconsin question the reliability of the report . . . on polarity . . . by Bela Ronay.

Norman R. Braton

Sir:

This article is confusing . . . see the AWS Handbook on the electric arc.

Carl Lashbrook

The AWS Handbook states ". . . the increased penetration secured with . . . reverse polarity." It is this seeming contradiction that has caused somewhat of a furor. Mr. Ronay's reply follows:

Sir:

Mr. Braton's inquiry and Mr. Lashbrook's remarks are fully appreciated in view of my "ex cathedra" statements.

The article should have been illustrated with macrographs and associated data. Fortunately, I have just completed arrangements which will enable me to do a moderate amount of laboratory work for such purposes.

In the course of the next several weeks, I hope to submit a brief extension of the article with substantiating data. This will re-introduce a now-forgotten term—the penetration ratio—which was the point of departure in specifying the use of polarity where the geometry of penetration affects the usability of the joint.

The AWS comments concerning the relationship between polarity and the geometry of penetration were given without reference to the experimental data which were made available to the orginal Nomenclature Committee, but which unfortunately were not published at that time.

Bela Ronay

Watch for Mr. Ronay's next article in WELDING ENGINEER.

"DURO is the coolest"*

*says Ben Ruff of Reed & Graham, Inc. "Before I had to change holders whenever the one I was using would get hot. Now, with DURO, I can weld a whole shift without the holder getting hot to my hand, even when using 5/16 in. hardfacing electrodes at high amperages."

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- The Duro Electrode Holder has served the welding industry since 1932. It is famous for long life, positive grip and perfect balance. All parts are easily renewed. Semi- or fully insulated. Duro is available in 250, 300, 400, 500 and 600 amperes capacity.
- Cool operation—cool handling. Featuring "Long Jaw Design" for reaching those "hard to get at places."

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- Another feature is the square guard. It protects hands from heat and also prevents rolling and grounding when placed on a flat surface. There when you need it, is a hex key fitted into the brass core and held in place by the fiber handle for making fast cable connections.

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Reprints from WE

Reprints of certain articles published in Welding Engineer are still available. A list of these appears below. Reprints may be obtained for 15 cents each, except where otherwise noted. Payment must accompany all orders. For quantity orders, write for special prices. Order by title from: Reprint Editor, Welding Engineer Publications, Inc., Box 28, Morton Grove, Ill.

Design for welding

Basic knowledge required when designing, or redesigning for welded construction is detailed and discussed. Sixteen page reprint includes 11 data sheets.

The meaning of weldability

Weldability of carbon steels and alloy steels, as well as some other metals, is discussed. Sixteen page reprint includes three data sheets.

Tungsten inert gas

A 16 page report on the history, theory and application of the Tig welding process. Includes data sheet on proper current selection. This reprint is free.

Welding of dissimilar metals

Complete details on welding dissimilar metals using NiCrFe electrodes and wires. Eight page reprint includes charts on properties, test results and data sheet on properties of other metals.

Acetylene

A 12 page salute to the IAA and acetylene, details the great success of this gas. Includes a history of the IAA and "The Acetylene Journal."

Fixtures for brazing

Presents requirements for designing brazing fixtures and materials to be used. Data sheet on properties of non-metallic fixture materials included. This reprint is free.

Selection, welding of CrMo alloy steel pipe

Discusses determining factors in selection of chromium-molybdenum alloy steels and evaluates the effects of pre- and postheat treatment on weld properties.

How to select proper regulators

Performance characteristics of equipment controlling gas flows during welding, cutting and other operations are given, as well as selection rules.

Filler metals for joining

Brazing filler metals are detailed and each group is analyzed. Includes data sheet on how to select silver brazing alloys.

Production welding controls

Discusses how material, labor and overhead effect total production welding costs, and how certain controls can result in greater time and dollar savings. This reprint is free.

New aluminum alloy not prone to brittle fracture

Extensive testing of 5083 aluminum alloy proves it has excellent weldability and weld ductility, and a good resistance to corrosion and stress corrosion. Testing for brittleness is detailed.

Explosive welding and forming open another door

A report on one of the newest entries into the welding industry, and how one pioneer company turned theories and practices into realities.

Our modern-day mythology

A rebuttal to some old-wives tales about the hazards of welding fumes, plus safety recommendations for situations where hazards might develop.

Understanding weld distortion and shrinkage

Causes of distortion and shrinkage can be determined if weld heat is understood. Eleven drawings are used to illustrate this welding problem.

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The Colmonoy Spraywelder produces smooth overlays of Colmonoy alloys that are fused to the base metal to form solid, welded wear resistant overlays that are easily finished, and wear up to forty times longer than hardened steel.

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News Shorts . . .

Chase Brass & Copper Co., Waterbury, Conn., is installing a new tube mill processing system at its Chase Metal Works plant. The project, at a cost of more than $2 million, is expected to provide marked savings in time and operation expense . . . A new multi-million dollar liquid air separation plant at Fairfield, Ala., was recently dedicated by **Air Reduction Sales Co.**, New York City. The facility will produce more than 30 tons of liquid oxygen, nitrogen and argon per day.

Union Tank Car Co., Chicago, has purchased a major interest in **Mechans Ltd.**, Glasgow, Scotland, fabricators of storage tanks, spheres, pressure vessels, and other metal and plastic products . . . **Alex Latta, Ltd.**, Edmonton, Alberta, has terminated its distributorship agreements with **Linde Co., Div. of Union Carbide Canada Ltd.**, Toronto.

Headquarters office personnel of American Climax Metal, Inc. and its operating divisions recently moved into a modern building at 1270 Avenue of the Americas, New York City. The shift put company executive management and staff personnel together for the first time since the firm was formed in 1957 . . . An award for distinguished service in engineering was recently presented to Charles J. Haines, president of Chemetron Corp. Chicago, by the University of Missouri. The bronze medal cited Haines for managerial ability in forming a strong and widely diversified company. Dean Huber O. Croft (right) of the U. of M. college of engineering presents Haines the award.

A record 10,214,912 man-hours worked without a disabling injury was set on March 25 by **U. S. Steel's** Gary, Ind., works. The firm stated this was the best ever accomplished in the steel industry . . . **Robotron Corp.**, Detroit, has adopted a new product grouping policy. The change, due to product line expansion, will split products into four divisions: resistance welding, automation devices, regulators, and induction heating.

Anchor Alloys Inc. has opened a new plant and facilities at 354 Manhattan Ave., Brooklyn, N. Y. The firm's office and sales department will remain at 968 Meeker Ave. in Brooklyn . . . A new corporate addition to the low-frequency induction melting equipment field is **Inductotherm Linemelt Corp.**, Delanco, N. J. The firm has an agreement to handle Swiss-made Brown Boveri melting furnaces in this country.

Modern Mfg. Co., Willow Grove, Pa., has purchased the **Super Slugger Co.**, Bedford, Ohio, makers of electric hammers . . . Improved fabricating techniques, new products, and architectural designs are among entries competing for honors in the 1960 Copper and Brass Achievement Award contest. Winner of the award will receive $1,000 from the **Copper & Brass Research Association**, sponsor of the competition, on May 17.

A multi-million dollar engine manufacturing plant is being planned by **Allis-Chalmers** at its Harvey, Ill. works. It will be devoted to production of diesel, natural gas, butane, and gasoline engines. . . **Thermionic Products Co.**, Plainfield, N. J., has bought the equipment formerly used by **Finn Aeronautical Division** of **T. R. Finn & Co.**, Hawthorne, N. J. . . . trustees of the **American Society of Metals** have created a technical council, whose purpose will be to supervise and co-ordinate the Society's technical committees.

A new line of resistance spot welders was recently announced by M. J. Ward, president of **Superior Electronics Service Co.**, Minneapolis, Minn. A new enlarged service department will handle all repairs and maintenance as well as sales and service . . . **Nu-Matic Grinders, Inc.**, Cleveland, has moved its manufacturing and headquarters operation from its former address to a new location with three times the floor space formerly available.

Chemetron Corp., Chicago, and the **Tennessee Coal & Iron Division** of **U. S. Steel Corp.**, Pittsburgh, will build the first plant in the South designed for welding sections of rail immediately upon their emergence from the steel rolling mill. It will be located at Ensley, Ala. **National Cylinder Gas Division** of Chemetron has put in operation a new transfilling plant to serve the Jacksonville, Fla. area with liquid and gaseous oxygen.

Among executives invited to attend the **National Defense Executive Reserve Training Conference** May 23-24 in Washington, D. C., are the following: Richard C. Lipps, **Westinghouse Electric Corp.**, Buffalo, N. Y.; George F. Clipsham, **Lincoln Electric Co.**, Cleveland; William B. Browning, **Linde Co.**, Chicago; Sam Sciaky, **Sciaky Bros.**, Chicago; Charles O. Stilwell, **Gweco, Inc.**, New Orleans. The conference will be concerned with the latest developments in non-military defense.

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News Shorts . . . cont'd.

Use of aluminum for low-bed trailers (see photo) saves nearly 5,000 lb overall weight per trailer without loss of strength or durability, according to manufacturers of the unit, **Vulcan Trailer Mfg. Co.**, Birmingham, Ala., and suppliers of the metal, **Kaiser Aluminum & Chemical Corp.**, Oakland, Calif. . . . A 15,400-ft., 48-in. diameter arc welded steel pipeline was run over swamp land and two water crossings by riding it on a wooden trestle. The pipe was laid near Everett, Wash. on a job for the city of Everett. The Lincoln welding generators (on rubber-tired carriages) rode atop the pipeline itself.

A new plant for stainless alloy brazing and furnace heat processing has been opened in Dayton, Ohio, by **Wall Colmonoy Corp.**, Detroit. Pit-type furnace facilities are capable of handling parts up to 28-in. in diameter by 35-in. high . . . Several thousand people attended a recent Industrial Progress Exhibition at which **Arcair Co.**, Lancaster, Ohio, displayed several of its products.

Ground has been broken at the Gary Steel Works of **U. S. Steel Corp.**, Chicago, for construction of a new rolling mill which will be capable of producing the widest steel plates in the world. The 4-high combination mill will replace a 160-in. plate mill built there during World War I . . . A special refresher course is being offered to public school teachers by **Hobart Bros. Welding School**, Troy, Ohio, during the coming summer.

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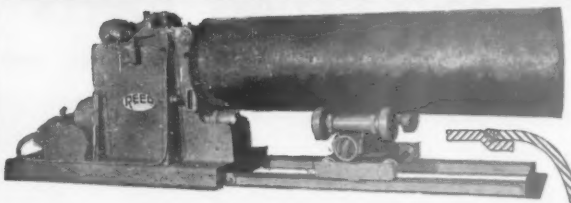


WEBB-REED OFFSETTER

This machine forms an offset flange around shell ends to facilitate automatic welding tank heads. It eliminates chill rings, decreases fit-up time, improves the concentricity of shell ends, and aids in reducing actual welding time. Tight, clean joints result. Three sizes of Offsetters handle up to ½" plate with standard dies. Illustrated with Turntable for reversing shell ends when both ends are to have offset flanges formed.

Permits rapid fit-up of tank heads into tank shells where offset joggle joints are used. Hydraulic pressure is applied through ball-and-socket swivel joints that allow the head cups to set to the head. Hydraulically powered kick-outs speed up loading and unloading. Both headstock and tailstock are adjustable vertically; tailstock is also adjustable along the bed for various lengths of vessels up to 18'.

Fit-up rolls are also available to facilitate proper alignment and assembly of shells lacking rigidity.

WEBB-REED ASSEMBLY PRESS

Horn Type Fixtures | Cylinder Flange Offsetters | Assembly Fixtures

Write for illustrated literature

Since 1881 THE WEBB CORP.
REED EQUIPMENT DIVISION
WEBB CITY, MO., U.S.A.

Pipeline News

Northern Natural Gas Co., Omaha, has received Federal Power Commission permission to construct pipeline facilities costing up to $4,000,000 during 1960.

The FPC has authorized El Paso Natural Gas Co., El Paso, Tex., to construct small scale budget-type routine natural gas pipeline facilities during 1960 at an estimated maximum cost of $798,250. The facilities will be used to deliver natural gas to resale customers in Texas, New Mexico and Arizona. In addition, El Paso has gained temporary authorization to construct and operate the necessary facilities to deliver gas to the Ocotillo steam electric generating plant being built near Phoenix, Ariz., by Arizona Public Service Co. El Paso will build about 14 miles of 16-in. pipeline and metering and communications facilities at an estimated cost of about $865,000.

Cities Service Gas Co., Oklahoma City, has been granted authorization to construct and operate gas pipeline facilities costing approximately $817,000. The facilities are about 10 miles of 20-in. transmission line looping the company's existing 12-in. Ottawa-Sedalia line in Franklin County, Kan.; about 4.5 miles of 16-in. transmission line in Johnson County, Kan.; and a 340-hp addition to its Knobnoster compressor station in Johnson County.

Distributor Appointments

Mullenbach Div., Electric Machinery Mfg. Co., Los Angeles: Ransome Co., Scotch Plains, N. J.

United Welders, Inc., Bay City, Mich: George A. Marshall Machinery Co., Charlotte, N. C.

J. B. Nottingham & Co., Inc., New York City: Charles Petty, Jr., Mobile Ala.; Floyd Davies, Cleveland.

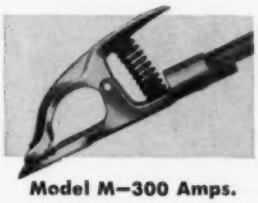
Hobart Bros. Co., Troy, Ohio: Livingston Oxygen & Equipment Co., Modesto, Calif.; Dakota Welding Supply Co., Inc., Watertown, S. D.; Lake Welding Supply Co., Muskegon, Mich.; Harold P. Elliott, Rapid City, S. D.; GWE-CO, Inc., New Orleans, La.; Hudson Valley Welding Supply, Inc., Poughkeepsie, N .Y.; Bartram & Johnson Co., Grand Junction, Colo.; Kessler Distributing Co., Richland, Iowa.

you do... with these NEW

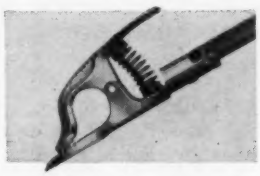
SuperGrip®

GROUND CLAMPS

Model L—500 Amps.



Model M—300 Amps.



Model S—200 Amps.

Quick and "handy" grounding speeds up the welding job and a positive connection saves welding power to produce more welding work per day. These new *SuperGrip* GROUND CLAMPS were designed by the industry's most experienced manufacturer of welding and safety equipment.

check these outstanding features:

EXTENDED LOWER LIP for easy clamping with quick "under and on" motion.

BALL POINT SET SCREW of "man size" diameter grips cable tightly for full cross-section connection.

CABLE SUPPORT LIP offers added wrap area to minimize strand breakage.

POWERFUL COMPRESSION of spring gives maximum "bite"... with spring fully insulated from grips.

BROAD, FLAT BASE JAW and heavy teeth offer large contact area for positive connection.

ASK YOUR WELDING DISTRIBUTOR *or write for Bulletin No. T2-R*

The FIBRE-METAL Products Company | CHESTER PENNA

In CANADA: Fibre-Metal (Canada) Limited, Toronto

About people . . .

Newly elected a vice-president of General Electric Co. is *L. Berkley Davis*. He is general manager of the company's electronic components division, which includes the Receiving Tube Dept. at Owensboro, Ky.

Robert F. Lutz has been named factory manager for Bosworth Steel Treating Corp., Detroit. He was chief metallurgist for Rockwell-Standard Corp., Detroit, for seven years.

James S. Vanick has chosen to retire after 38 years with International Nickel Co., Inc., New York City. He has been research metallurgist with the company's development and research division.

Charles A. Stratton and *Robert E. Haas, Jr.*, have been added to the field engineer force of Lincoln Electric Co., Cleveland. They were assigned to Kansas City and Chicago, respectively.

Opie

Leaming

Named by Glenn Pacific Power Supply Corp., Oakland, Calif., as eastern and midwestern managers respectively, are *Robert R. Leaming* and *Henry C. Opie*. Both men were formerly employed by Metal & Thermit Corp., New York City.

E. E. (Dusty) Rhodes, formerly a service engineer for National Electric Welding Machines Co., Bay City, Mich., has joined K. Wm. Ostrom Co., Inc., Drexel Hill, Pa., as a sales engineer. Ostrom is an exclusive sales representative for National Electric.

Charles E. Paules has retired as a vice president of Esso Research and Engineering Co., New York City, after an association of 41 years. During his employment with Esso, Paules was primarily responsible for the construction of 35 oil refineries throughout the world.

Neilson

Busby

Robert T. Neilson has been appointed plant manager of National Welding Equipment Co., San Francisco.

Selected as field supervisor by Eutectic Welding Alloys Corp., Flushing, N. Y., is *John T. Busby*, formerly a technical representative for the company.

George J. Miller has been appointed plant superintendent for Titan Metal Mfg. Co., Division of Cerro de Pasco Corp., Newark, Calif.

Alva Allen Industries, Clinton, Mo., has appointed *Matt P. Hirt* as a factory representative for Missouri, Oklahoma, Nebraska, Iowa, Kansas, Minnesota, and the eastern portion of North and South Dakota.

H. Wallace Rowles has been named manager of structural and plate products for U. S. Steel Corp., Chicago, succeeding *Loring S. Brock*, who was named executive vice president. Taking Rowles' place is *Dale L. Armstrong*.

Retiring after 42 years of service with American Emery Wheel Works, Providence, R. I., is *William W. Turner*, who was secretary and a member of the firm's board of directors. *Gilbert E. Perkins* has been named production manager for American.

Appointed as engineering assistant to the president of Inductotherm Corp., Delanco, N. J., is *Theodore R. Kennedy*. Kennedy has been in the induction heating field for many years.

Allis-Chalmers Mfg. Co., Milwaukee, has appointed *W. Glenn Williams* as manager of product sales for the rectifier section, and named *M. M. York* manager of marketing of the industrial equipment division.

Walter C. Bennett has retired as chairman of the Phelps Dodge Refining Corp., New York City. He has been chairman since 1955 and was president from 1938 to that time.

William Bajari is now a field representative for Arcair Co., Bremerton, Wash. He will work with the firm's distributors and call on industries in 13 western states. Also, *Richard Henderson* has been named chief engineer for Arcair at Lancaster, Ohio, where he will be in charge of product design, research and development.

Roger M. Freberg has been named sales engineer for the Vacuum Division of F. J. Stokes Corp., Philadelphia. Freberg will manage the Stokes district office in Pasadena, Calif.

Several personnel changes have taken place in divisions of Chemetron Corp., Chicago. *Austin G. Scherrer*, formerly regional manager in New Jersey for National Cylinder Gas Division, has retired after nearly 30 years of service. *Thomas J. Fallon* has been named Boston district manager for NCG, and *Chester E. Whiting*, a former salesman, has been selected to succeed Fallon as South Meriden, Conn., branch manager. Tube Turns Division has named *Jack D. Tolliver* to the newly created position of field sales manager, thus expanding his duties to include supervision of sales in all U. S. district office territories.

AT dinner honoring Austin G. Scherrer (center) were J. L. Adank, NCG president (left), and C. D. McGuinn, division vice president (right).

Burnett

O'Neill

C. M. (Mike) Burnett has been named district representative for the south central states by Hobart Bros. Co., Troy, Ohio. He will supervise the distribution of the firm's products in Louisiana, Texas, and New Mexico.

Robert F. O'Neill has been promoted to manufacturing manager of the Cambridge Division of Standard Steel Corp., Los Angeles. O'Neill will be responsible for all phases of the actual plant production of the cryogenic equipment manufactured at Lowell, Mass. At the same time, Standard announced the advancement of *Thomas Duff, Jr.*, to head of quality control at Lowell.

J. S. Stevens has been chosen district manager of the Birmingham office of Air Reduction Sales Co., New York City. Stevens succeeds *J. M. Crockett*, who has been transferred to the company's head office. *Joseph DeSanto* has joined Air Reduction's sales staff at Chicago.

Clarence Bennett has been appointed section head of the welder product group at Vickers Inc., Electric Products Division, St. Louis. He was formerly head of the welder engineering design section.

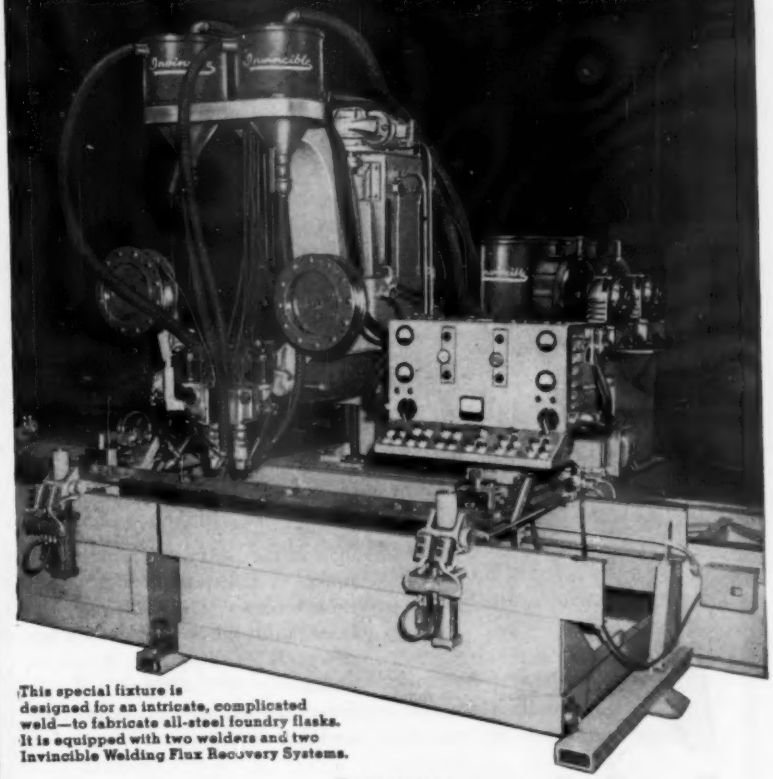
After five years with the firm, *Robert E. Groening* has been appointed general sales manager of United Welders, Inc., Bay City, Mich. He will lead the company's sales emphasis on its automated machines.

Officers of the newly formed Progressive Welder & Machine Co., Detroit, will remain the same as those for the original firm. They are: *Ray W. Heiden*, president; *John Johansen* and *Harry S. Rose*, vice-presidents; *Josephine Johnson*, secretary, and *Ralph Pehrson*, treasurer.

Welding Fixture and Positioner Manufacturers Specify . . .

INVINCIBLE

WELDING FLUX RECOVERY SYSTEMS



This special fixture is designed for an intricate, complicated weld—to fabricate all-steel foundry flasks. It is equipped with two welders and two Invincible Welding Flux Recovery Systems.

Because:

- INVINCIBLES recover *all* unfused flux on submerged arc welding jobs, remove powder and return slag-free, dust-free flux to the welder in a *continuous* flow. Savings in reclaimed flux *alone* repay their cost in a few months, or even weeks. And they save costly man-hours over manual methods, speed production, minimize costly rejects by eliminating flux flour.
- INVINCIBLES are available in 14 standard automatic and manual models from 1½ to 7½ horsepower *plus* special machines and combinations. All feature compactness, flexibility and rugged construction.
- INVINCIBLE's resident engineers in all principal cities will assist you in achieving maximum savings from submerged arc welding operations.

SEND FOR FOLDER on Invincible Flux Recovery Systems

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

Tempilstik°

*temperature indicating crayons**

*Also Tempil° Pellets and Tempilaq° (liquid form)

Tempilstik°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.

Send for free sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

WELDING SALES DIVISION

Tempil° CORPORATION
132 West 2nd St., New York 11, N. Y.

G. N. Bull has been named district manager of a new sales engineering area established in Florida by Lincoln Electric Co., Cleveland. Bull is moving to Miami from New York where he has been district manager since 1926. Lincoln has also named *Russell S. Hale* manager of the Boston Engineering district. He was formerly district manager in Albany.

Appointment of *George F. Topinka* as chief engineer, Power Cylinder Div., Hannifin Co., Des Plaines, Ill. was recently announced. Topinka came to Hannifin from Borg-Warner Corp., Chicago, where he was administrative engineer in charge of new product design and development.

Bonded Abrasives Div., Carborundum Co., Niagara Falls, N.Y., has made the following appointments: *H. B. Jorgensen* to supervisor, sales training section at Niagara Falls; *M. F. Jenkins,* to field sales engineer in the central Indiana area; *H. Porth,* to salesman in a new Indianapolis territory; *K. W. Martin,* to salesman in the Syracuse territory; *W. W. Spiller,* to salesman in the Buffalo territory; *J. H. Jones,* to salesman in a new Arizona territory; *G. S. Schroyer,* to salesman in the Salt Lake City territory; *R. R. Kerrigan,* salesman, Rockford, Ill. territory; *P. R. Junod,* district sales manager, Philadelphia district.

In a series of related promotions, *Herman H. Kremer* was elected vice president in charge of sales and director for Chase Brass & Copper Co., Inc., Waterbury, Conn.; *Walter E. Evans* has been named assistant to the president, and *Paul M. Thomas* has been appointed general sales manager.

Four men have been promoted to vice president by Metal & Thermit Corp., New York City. They are *Harry W. Buchanan, Donald W. Oakley, John K. Parks,* and *James L. Oberg.* At the same, M & T has appointed *Peter L. DeDecker* as a welding sales engineer for the west-central region. His headquarters will be in Davenport, Iowa. Also, *Albert E. Sakavich* has been named to the staff of the firm's advertising department.

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INSURES GREATER

Safety

thats why

THERMO-

FILTER PLATES

and

COVER LENS

are *FIRST CHOICE* EVERYWHERE

Thermo Filter Plates guaranteed to have less variation in density. Blue-green tint eliminates fatigue and eye-strain.

Laboratory tests prove Sta-Kleer All-Plastic Cover Lens last longer because they are more heat and scratch resistant.

Triple-Duty Glass Coated Cover Lens outsell all others on the market because they repel molten weld slag. Will not peel or discolor.

THERMACOTE
COMPANY
108 So. DeLacey Ave., Pasadena, Calif.

Dr. Wilfred F. L. Place has been appointed vice president and general manager of Norton International, Inc., the foreign division of the Norton Co., Worcester, Mass. He succeeds *Frank M. Ryan,* who retired Jan. 29, after more than 46 years with the company. Other retirements in the firm involve *Irving W. Stanton, Francis N. Luce,* and *George Crompton.* Stanton, who was with the firm 33 years, retired as exhibition engineer; Luce, assistant superintendent of the company's Milan, Italy plant, has 39 years with Norton. Crompton, a patent counsel, was with the firm 25 years.

Appointed to the newly-created post of manager of market development for the Receiving Tube Dept., General Electric Co., Owensboro, Ky., is *Louis M. Robb.* He will be responsible for analysis and study of existing and potential markets and market patterns for receiving tubes and other electric components.

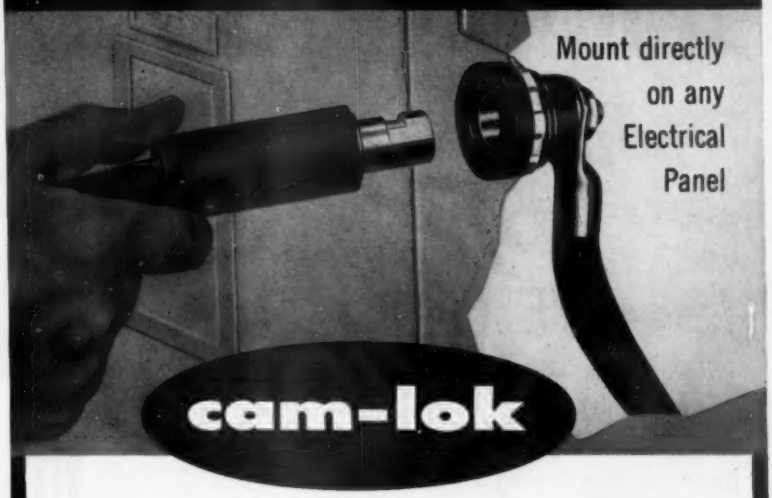
Modern Engineering Co., St. Louis, has named *Roy Brigance* and *Vint Gubbins* as factory sales representatives. Brigance will work with distributors in Ohio and adjacent areas, with headquarters in Cleveland. Gubbins will cover the firm's Illinois territory. Also for Meco, *Frederic Marrero* has joined the export division to work with distributors in Latin America.

Formerly vice president of the Budd Co., Philadelphia, *J. G. Richard Heckscher* was appointed executive vice president of the Franklin Institute effective Feb. 1. Heckscher, a welding engineer, had been with Budd 27 years.

Named sales manager of the New York plant of Joseph T. Ryerson & Son, Inc., Chicago, is *Wallace E. Felldin.* He is succeeding *Henry B. Williams,* who is retiring Aug. 1 after 44 years with the steel firm.

Pacific Coast Engineering Co., Alemeda, Calif., has appointed *Gavin Embry* as industrial engineering manager. A specialist in organization and systems planning, Embry has been with Paceco since 1957.

New Hi-Impact Plastic Insulated
Panel Receptacles and Mating Plugs



Now, you can make fast, positive power connections to any metal panel or housing without special insulating materials. Simply punch out a hole and insert a Cam-Lok self-insulated Receptacle! Uses standard electrical lock-nuts, affords "dead-front" protection. Push in and twist Cam-Lok mating Plug and you've made a locked connection, which can be released quickly.

New Cam-Lok Receptacles eliminate costs of special insulating panels and reduce assembly time. Patented, high-pressure contact assures minimum resistance and heating.

Cam-Lok has a complete line of Receptacles and Plugs in many sizes and designs. Standard and special purpose Power Distribution Connections are available. Write today for new Bulletin No. 301.

"Dead Front" design for fast direct mounting on . . .

• ELECTRICAL DISTRIBUTION PANELS • SWITCHGEAR
• BUS DUCT • JUNCTION BOXES
• WIREWAY or any electrical cubicle

cam-lok DIVISION

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VALUE VERSATILITY

···you get more of both in the

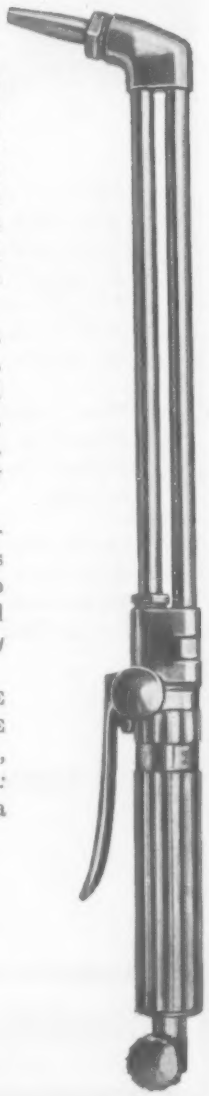
PUROX TRADE MARK "E" Cutting Torch

When LINDE first offered the PUROX "E" Torch to industry, Ford's model T automobile sold for less than $500. Today's average car costs at least 350% more. *But the price of the "E" torch has gone up only 22%.* Since practically every part in it has been refined for improved performance and longer life, the PUROX "E"—granddaddy of cutting torches—is still one of the biggest oxy-acetylene apparatus values to be found anywhere.

Whatever your present requirements, there's a PUROX "E" Torch to take care of them. Choose a head angle of 75, 90, or 180 degrees in standard 20½-in. length, or a 36-in. model with 90-deg. head. Should new or special needs develop at any time, any model can be adapted to meet them by simply replacing the front-end assembly.

With four interchangeable front ends and 57 different nozzles, the PUROX "E" Torch easily handles any practical hand-cutting job. It cuts steel up to 12 in. thick, washes pads, cuts rivets, gouges, and pierces. *And it performs efficiently on acetylene or any other commercial fuel gas available.*

See the PUROX "E" Torch today at your LINDE Distributor's. Or write for free folder, F-1313. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.



Linde Trade Mark

UNION CARBIDE

The terms "Linde," "Purox," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

McNally

Wilcox

Waite

Davis

Three men have been named as product sales and service managers at Arcos Corp., Philadelphia. They are *Wayne L. Wilcox,* who will manage for stainless, low and high alloy welding; *James McNally,* who will serve as technical expert in semiautomatic and automatic CO_2 and submerged arc welding of mild steel; and *Matthew Waite,* who will be responsible for technical aid in aluminum, magnesium and reactive metals.

Formerly with the U. S. Atomic Energy Commission, *Frank W. Davis* has been appointed technical consultant at Southwest Branch Institute, San Antonio, Tex. He will work in an advisory capacity in materials and structural research.

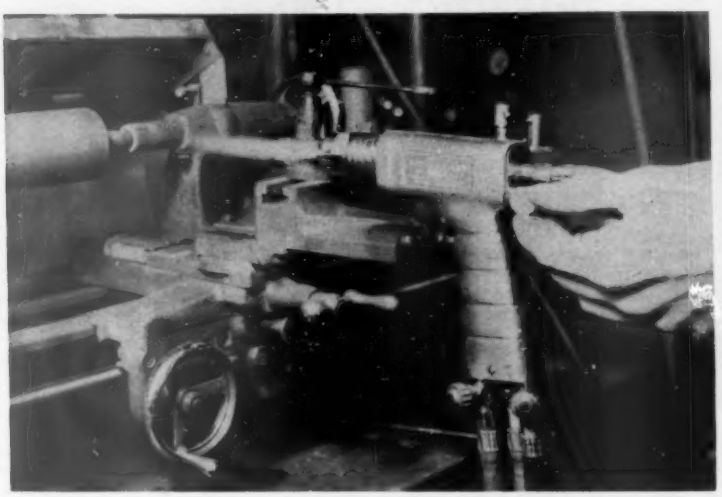
Died . . .

Charles Ness, retired since 1956, died on March 13. Mr. Ness, who for many years was associated with the Acetylene Research Division of Prest-O-Lite Co., was awarded the 1951 Morehead Medal in recognition of his contributions to design for safety, efficiency and economy in generation, distribution and packaging of acetylene.

Lockwood Hill, 73, died of a heart attack March 24. Mr. Hill was founder and chairman of the board of Hill Equipment Co., St. Louis. An electrical engineering graduate of Cornell University, he founded the original St. Louis Welding Society in 1931.

New products . . .

. . . use card on page 103



Spray welder

Lightweight, compact spraywelder unit has 12-lb per hour spray rate and up to 95% deposit efficiency. Major physical improvement in redesign of unit is simplification of controls. Former trigger and powder flow controls have been combined into one simple positive-acting operative valve. Elimination of trigger mechanism substantially reduces the space requirement. New unit is 20% lighter than former model, is said to have efficient air filter and regulator. Simpler tip alignment procedure makes tip changing easier, and hopper portion of unit has been enlarged. *Wall Colmonoy Corp.*

Circle No. 1

Lead pot-furnace

Electro lead pot and furnace is a one-piece, fully insulated unit. intended for melting of lead, solder, babbitt, etc. Unit is made in 25-, 45-, and 75-lb capacities, with a temperature range of 600 F to 1,000 F, and produces no noise or fumes. *Maurice Fetterman Co.*

Circle No. 2

Hardfacing flux

Inert automatic welding flux was specially developed for use with automatic submerged-arc hardfacing wires. A truly inert flux, it will not cause complicated alloying effects with deposited metal, manufacturer states. Material is available in 80-lb bags or in a fiber, plastic lined drum at extra cost. *Hobart Bros. Co.*

Circle No. 3

Pneumatic grinder

Pneumatic grinder has a choice of ten operating speeds for driving small grinding wheels, rotary files, carbide burrs, and sanding and cutting discs. Series 921 grinders are intended for burring, die grinding and contouring, flash removal, snagging, weld smoothing, and other metal-removing operations. Speeds from 16,000 to 25,000 rpm are available. Spindle and collet adapters permit accommodating a wide choice of grinding wheels and mounted accessories. *Thomas C. Wilson, Inc.*

Circle No. 4

Cleaning tool

New method of fastening head of Tomahawk chipping hammer to shaft is claimed by manufacturer to be safest. Head, which is press-fitted on the shaft and secured by a steel pin, cannot loosen or turn on the shaft. *Atlas Welding Accessories, Inc.*

Circle No. 5

Brazing alloy

Low fuming brazing alloy is designed for general purpose welding and brazing work. Its low melting point allows free flow and produces a tough, yet ductile weld deposit of very high tensile strength, manufacturer claims. Rod is degasified and deoxidized for low fuming characteristics. *American Brazing Alloys Corp.*

Circle No. 6

Rectifier assemblies

Standard rectifier assemblies are available employing firm's style 21 and style 33 diodes. Bridge assemblies using the style 21 diodes are rated up to 39 amp single phase and 58 amp three phase. Bridge assemblies using the style 33 diodes are rated up to 75 amp single phase and 112 amp three phase. All stacks are available with cell voltage to 600 p.i.v. *Syntron Co.*

Circle No. 7

Three-position valve

Three-position, four-way dual solenoid valves utilize only two moving pilot cores and four flexing diaphragms. Dead tight seating on air and liquids provides precision positioning of cylinders without creeping or drifting problems, says manufacturer. Valves can handle air, water and oil from 10 to 250 psi, on a-c or d-c voltages. *Automatic Switch Co.*

Circle No. 8

Your "LINDE" Distributor WANTS TO HELP YOU... TO DO A BETTER JOB!

Your success is his success. As your business improves, his business with you increases. As your confidence in him grows, it benefits you both.

Your local LINDE Distributor offers a complete line of industrial gases, equipment, and supplies. He can satisfy almost any welding or cutting need *from stock.*

Difficult welding or cutting problems? See your LINDE Distributor. His technical background and experience, backed by Linde Company resources, can help get you on the right track quickly.

Talk with your LINDE Distributor today. As an independent local businessman, he is vitally concerned with your success. If you can't find his name in your telephone directory, write for it. Dept. 310, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde

UNION CARBIDE

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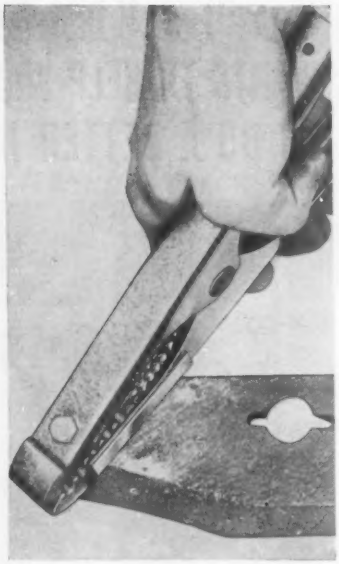


Ground clamp

Cable of new clamp runs inside the handle up to the jaws, reducing the probability of cable twisting off at the point it enters the clamp. Other features include heavy-duty jaws which open up to 2½ in., allowing operator to clamp on to larger items, built-in rust and scale scraper to insure better grounds, and handle insulators. *Twentieth Century Mfg. Co.*

Circle No. 9

Hardfacing electrode

Tufanhard 375 is an extruded heavily coated arc welding electrode for good wear resistance under medium impact conditions, says manufacturer. The weld deposit is non-machinable but can be forged at a bright cherry red heat. It has a stable coating in which iron powder has been added for increased deposition. Approximate hardness of the weld deposit in Brinnell 375; Rockwell C 40. Standard package is 50 lb per box. *Hobart Bros. Co.*

Circle No. 10

Brazing alloy

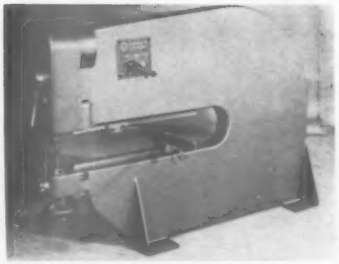
Copper phosphorus alloy does not require flux on copper joints, starts to melt at 1,300 F and has a wide brazing range An extremely ductile rod with high corrosion resistance, it is adaptable for the electrical, construction, air conditioning, heating, plumbing, and manufacturing industries. Tensile strength is 90,000 psi. *American Brazing Alloys Corp.*

Circle No. 11

Silicon rectifier

Pre-engineered high power silicon rectifier stacks incorporate built-in paralleling reactors to insure equal current distribution through parallel circuit branches. Units feature ratings up to 750 amps, with from 50 to 600 volts peak reverse voltage ratings. Standard "building block" is a 2-1-2-D "doubler" module with integral paralleling reactor, and four 70 amp rated silicon junction rectifiers mounted on copper cooling fins. *International Rectifier Corp.*

Circle No. 12



Sheet working machine

Sheet and plate working machine has an edge-cutting capacity in mild steel of 5/32-in. Junior model was designed for model shops, engineering departments and research and development laboratories, has a throat depth of 28½ in. Tooling adapts it for nibbling, straight and circle cutting, bending and other work. *Homestrand Machine Tool Corp.*

Circle No. 13

Combination starters

The disconnect operating handle on new switch-type line of combination starters is permanently attached to the switch, eliminating the hazard of false indication of switch position when door is open. Switch cannot be operated unless door is completely latched and sealed. Fuse clips are interchangeable, and can be spaced to accommodate either 250-volt or 600-volt fuses. Front operation of the switch makes ganging easy, and through wiring simplifies installation. *Square D Co.*

Circle No. 14

Riegel

. . . the preferred glove among skilled welders

TOPS IN DOLLAR VALUE

CHOSEN BY SKILLED WELDERS for extra heat protection, greater finger dexterity, and all-around comfort. Horsehide and "Flextan" leathers stay soft after dry-cleaning. Exposed seams completely welted. Seamless backs.

CHOSEN BY EXPERIENCED BUYERS for soft, sure comfort, longer wearability, excellent price, and quick acceptance in the plant...backed by Riegel's ready service and quick delivery.

COMPLETE LINE for any welding need. Let Riegel's specialists help match the right glove to the job. Ask for free catalog.

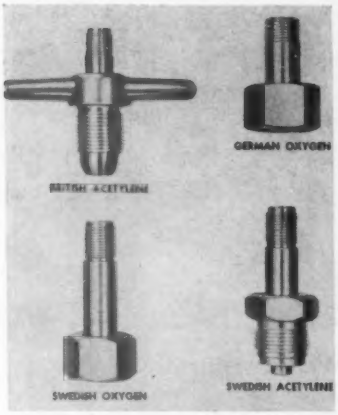
GENUINE HORSEHIDE PALM No. 956
Horsehide Palm, clute pattern cut extra long to prevent wrist chafing, and fourchetted for extra comfort and dexterity. Welted and wool-lined for complete protection.

HEAVY WELDER No. 997
Top quality green "Flextan", lined for heavy, hot jobs.

WELDERS MITTEN No. 987
Green "Flextan" leather, excellent protection, flexibility of finger movement.

SPOT WELDER No. 897
For lighter jobs, unlined green "Flextan" leather.

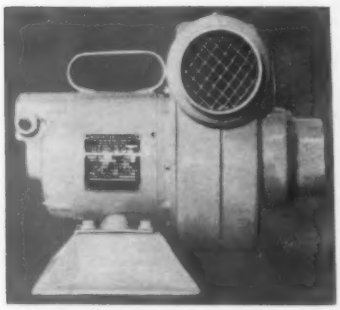
RIEGEL TEXTILE CORPORATION • Conover, N. C.



Cylinder adapters

Oxygen and acetylene adapters are designed to bridge the difference between standard pigtail outlet connections used in the U. S. and connection forms used in European countries. Adapters are offered for German, British and Swedish oxygen and acetylene cylinder connections. Foreign connectors may be adapted to either standard POL or commercial connections. Oxygen adapters are available with standard CGA 541 form. *Bastian-Blessing Co.*

Circle No. 15



Pressure blower

Portable pressure blower is compact and lightweight. Latest models include No. MPB-25, in which the ¼-hp capacitor motor is totally enclosed. Eight bladed, balanced impeller, as well as housing and other parts are of cast No. 43 aluminum alloy, which resists the action of many corrosives. Unit may be operated in any position, weighs 35 lb and delivers 435 cu ft of free air per minute. All models may be had for 115, 220, or 440 a-c and 110-volt d-c service. *Manhattan Electric and Maintenance Co.*

Circle No. 16

Cutting torch

Rugged duty cutting torch has flow capacity which enables it to cut 24-in steel. Primarily designed for cutting under all conditions, Tuf-Tony adapts to a wide variety of applications by use of interchangeable tips. Control valve permits gradual introduction of cutting oxygen. At a weight of 3 lb 10 oz, the torch is available in lengths of 21 in. and 36 in., with heads of 75 and 90 deg. *Smith Welding Equipment Corp.*

Circle No. 17

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C-CLAMPS
...with PERMA PAD
...punish it!
...pound it!
...it'll never
come off!
NOW! AVAILABLE IN DROP FORGED STEEL
AS WELL AS DUCTILE ALLOY STEEL . . .
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All-State's JET FLUX® and JET FLUX DISPENSER® on production line at Griggs Manufacturing Co. Acetylene and Jet Flux mixed and fed automatically from Dispenser.
ALL-STATE makes quality fluxes for torch and soldering iron applications on all commercial metals . . . in the form you prefer: liquid, paste, powder, flux cored solders, flux coated rods. Working temperatures range from 300F to 2200F. Designed for maximum wetting action, minimum fuming. For instance:
DUZALL . . . a new liquid flux for all soft solders, all metals (except light metals). DUZALL eliminates pre-cleaning, increases capillary action, leaves minimum deposit. Comes in handy 4 oz. refillable dispenser-type plastic containers, and in larger units.
#11 BRAZALOY® . . . a paste or powder flux for use on 14 ferrous and bronze alloys. Wide temperature range: 1200F to 2200F. Non-corrosive, non-fuming. Also available extruded on Nickel Silver welding rods.
#31 BRAZALOY® . . . a highly active aluminum brazing flux that gives maximum wetting action, excellent capillary flow. Protects surfaces from discoloration, requires less after-cleaning. An outstanding temperature indicator.
S200 SILVER BRAZING FLUX . . . melts at 600F, becomes transparent at 1100F, protects heated base metal to 1800F. Induces excellent capillary action and flow of silver alloys.
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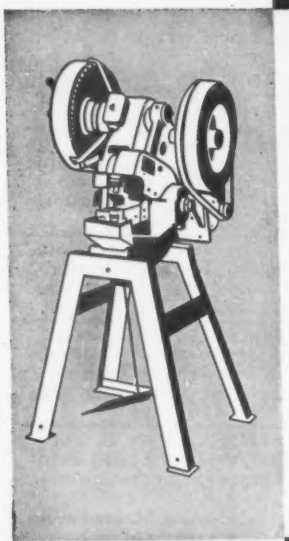
BATEMAN BANTAM IRON WORKER



THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

No Grinding Necessary After Cut. One Stroke Cycle Clutch Operater by Hand or Foot

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

Bateman Bantam with punch....$575.00
Shear only $495.00
Shipping wt. 750 lbs.

WRITE TODAY for complete information and name of nearest distributor

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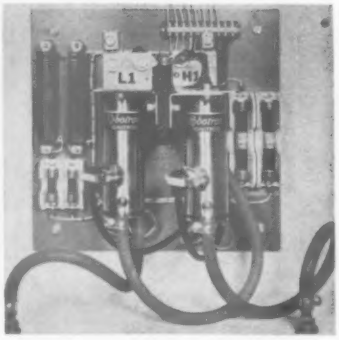
MINERAL WELLS, TEXAS



Welder control

New welding control and power system combines all advantages of normal resistance, capacitor discharge and percussion welding with none of their inherent disadvantages, says manufacturer. Known as "spike power" welding, system utilizes new type tube called a coaxial ignition tube contractor which is capable of handling very high peak currents for short time periods without misfiring or breaking down. *Robotron Corp.*

Circle No. 18

Epoxy compound

Epoxy tooling and repair compounds, one a putty, the other a liquid, have good tensile and comprehensive strength, resist most chemicals and oils, and will bond to all types of metals, wood, ceramics, etc., says manufacturer. Available in gallons, 5-gallons, and drum quantities. *Devcon Corp.*

Circle No. 19

Welder-power plant

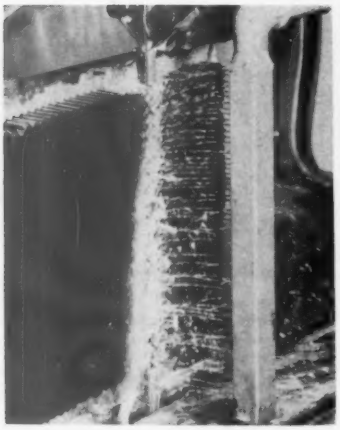
Powered by an air-cooled gasoline engine, new a-c/d-c welder delivers 300 amp at 30 volts a-c or 225 amp at 30 volts d-c at 100% duty cycle. Unit can be used to warm viscous fluids for pumping, to thaw frozen pipes, and to charge and boost batteries. *Miller Electric Mfg. Co., Inc.*

Circle No. 20

Oxygen regulator

Large capacity, diaphragm type pressure regulator may be used with most non-corrosive gases and is particularly useful in controlling the flow of gases which originate at a liquid container. Double gage boss permits mounting pressure gage in a convenient position regardless of regulator orientation. Rugged aluminum body and bonnet are suitable for maximum inlet pressure of 400 psi. *Bastian-Blessing Co.*

Circle No. 21



Quenched arc cutting

New line of slicing machines utilize electrical "quenched arc cutting" and are especially suited for machining honeycomb of aluminum, stainless steel or titanium, and other fragile cellular structures made of foil or thin-wall tubing. Work is sliced away by a band that removes as waste only 1/32 in. of material. Instead of making honeycomb core in rough individual blanks and grinding away waste material, it now is possible to start with a "log" and slice off pieces to finished size. Cutting rate is 5 to 50 sq in. per minute for finely finished work and 150 to 200 sq in. per minute where foil edge finish is not important. *DoAll Co.*

Circle No. 22

Induction melting unit

Known as Integral 50, compact, 50-kw combination motor-generator and control unit contains entire power supply, capacitors, control and safety devices necessary to operate one or two high-frequency induction furnaces or coils. Unit contains an eight-step auto transformer and a 32-position compacitor switch for maximum flexibility in meeting any heating or melting requirement, says manufacturer. Installation requires a 60-cycle, 220- or 440-volt power connection, cold water connection and drain. *Inductotherm Corp.*

Circle No. 23

"Transparent" disc

Fiber-backed abrasive disc with two parallel straight sides gives transparent area at work surface, allows operator to grind without pulling machine away for frequent inspection. Because actual grinding is intermittent, metal remains cool. Discs are surfaced with an aluminum oxide abrasive, in standard range of grit sizes. Pads are surfaced with a diamond grid pattern to prevent slippage. *Behr-Manning Co.*

Circle No. 24

Bench welder

Line of precision dual head, dial feed bench welders is designed for mass production of small parts, particularly the high-speed assembly of small electrical components. Machine has six-station dial feed mechanism, three vibratory hopper feed units, and an automatic ejector mechanism. It simultaneously projection welds support ears to the ends of two styles of yokes for a duplex electrical outlet. Production rate is 1,500 to 1,700 parts per hour. *Precision Welder and Flexopress Corp.*

Circle No. 25

D-c welder

Manufacturer claims "x-ray perfect Mig welds on aluminum, magnesium, stainless and carbon steel sheets down to a thickness of 0.030 in." for its new constant potential d-c welder. New model is also said to provide continuous slope and voltage adjustment while welding, between limits of 300 amps at 30 volts and 25 amps at 10 volts. Both spatter and burn-through are eliminated, according to *Miller Electric Mfg. Co., Inc.*

Circle No. 26

on "tough" snagging and grinding operations . . .

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This **NEW** powerful but light-weight grinder does **MORE WORK** with less operator fatigue . . . **DESIGN-ENGINEERED** for use with 9" disc wheels . . . can be plugged into nearest 120-v. AC power outlet . . . **LIFE-TIME LUBRICATED . . . TAMPER-PROOF SEALED . . . SIX MONTHS WARRANTY.** All this . . . and more for only **$168.00** f.o.b. nearest distributor.

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FOR YOUR CONDITION, I PRESCRIBE REPLACEABLE TUFFCAP TIPS
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In 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding foundation—and

MORT CLARK'S GALV-WELD ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

TIME PROVEN - MODESTLY PRICED
WHY EXPERIMENT?

Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.

Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.

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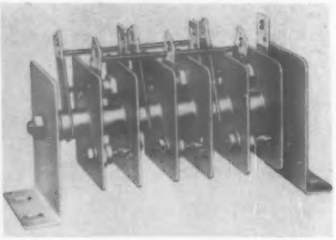
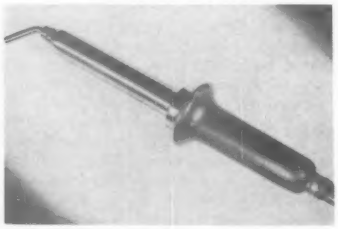


Power rectifier

Double diffused silicon power rectifier is rated at 13 amps average at 25 C ambient on a 3 x 3 x 1/16-in. copper heat sink. Standard and reverse polarity are achieved through the double diffusion. Typical forward dynamic resistance is 0.009 ohms. *Syntron Co.*

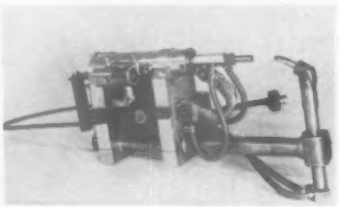
Circle No. 28



Plastic welder

Utility plastic welding torch incorporates reinforced fiber-glass handle which is highly resistant to breakage and always cool. A 350-watt, 110-volt heating element develops top temperatures quickly and is highly resistant to breakage. Model is 11½-in. long with tip, weighs 11 oz., comes packed in compact metal carrying case. *Laramy Products Co.*

Circle No. 29



Portable gun

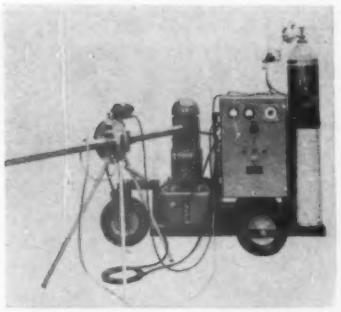
Lightweight (41 lb) C-type spot welding gun features an integral 12,000 amp transformer, universal lower arm, interchangeable lower electrode holder (60 and 90 deg), a 7-in. throat and adjustable gap. High speed solenoid valve at the cylinder provides quicker action while saving air. *Cooper Welders, Inc.*

Circle No. 30

Thermocouple

Expendable immersion thermocouple for measuring molten metal temperatures consists of a ceramic base which serves as a mounting for the noble metal wires. A firmly anchored transparent silica tube protects the thermocouple wires and is, in turn, protected from slag and floating solids by a special metal cap which absorbs the physical shock of immersion and melts away immediately after it has plunged beneath the slag. *Englehard Industries, Inc.*

Circle No. 31



Tube welder

Mark II welder is portable and can be rolled through an 28-in.-wide opening. Sanitary tube fittings from 1½-in. to 4-in. size can be welded automatically. Welding fixture rotates at a predetermined speed around the tubing. Tube axis may be in any position from horizontal to vertical. Control panel includes a manual position so that the welding generator may be employed to weld materials other than tubing by addition of manual welding cables and torches. *Cycl-O-Magic Inc.*

Circle No. 32

Power saw

Two new models of power saws can cut work like tool blanks directly to the clearance angle, eliminating the intermediate operation. Heavy turntable permits entire cutting portion of the machine to be rotated from 90 to 45 deg. At 90 deg the capacity of this machines is 12-in. high x 16-in. wide. At 45 deg, capacity is 9-in. rounds, 8-in. pipe, 12-in. standard flange I-beam with web vertical or 10-in. standard flange I-beam with web horizontal. Model C-168A has an automatic stock indexing table that permits the operator to select any length cut up to 24-in. *Do-All Co.*

Circle No. 33

Automatic torch

Compact, lightweight, completely automatic brazing torch provides maximum economy and efficiency in temperature ranges approximating 4,000 F, says manufacturer. Gas flow switch is placed for easy control with a finger. Tip is angled to provide greater flexibility in directing the flame. When control switch is released, flame is immediately extinguished. Ignition power is supplied by two standard pen-lite batteries. *Prest-O-Matic Co., Inc.*

Circle No. 34

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They mean National Carbide's calcium carbide- Real potent... it's hot-crushed!
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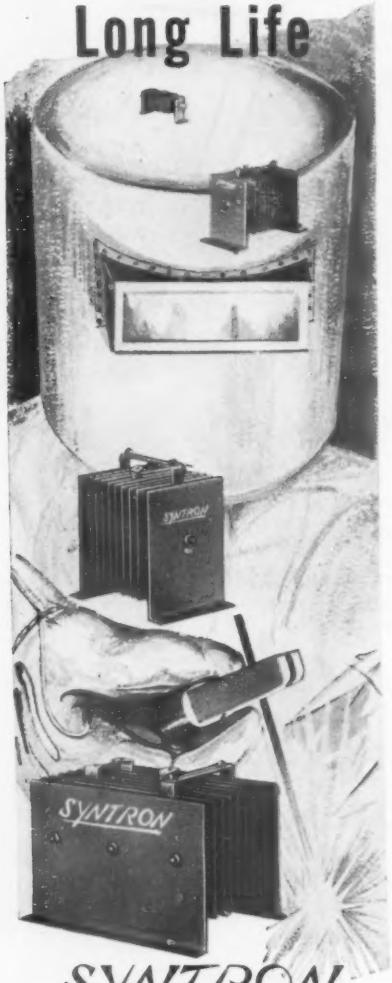

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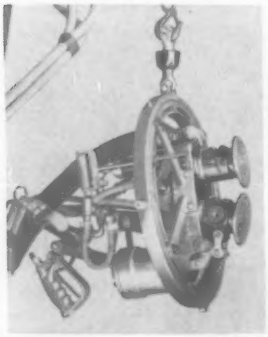
Sales Engineers: New York, Cleveland, Chicago, Los Angeles and Canada

Farm welder

Plug-in type 180 amp farm welder has 14 different taps for heat settings from 20 to 180-amp output. This feature, in addition to two different grounds (high and low) provides power variation so that proper heat may be selected for any type of job. Convection cooling in the unit eliminates troublesome fans and blowers. *Twentieth Century Mfg. Co.*
Circle No. 35



Roll spot welder

Portable roll spot welder is specially designed to weld three thicknesses of metal which require high clamping pressure. New unit has synchronized, double-wheel, airmotor drive, is effective for cumbersome jobs such as automotive roof panels, deck lid openings, and wheel housings. Spot frequency is adjustable between ⅜-in. and 1½-in. automatic spacing, and two or three thicknesses of 0.032 sheet are easily handled, firm says. *Progressive Welder & Machine Co.*
Circle No. 36

Metal polish

In addition to cleaning and polishing aluminum, all-purpose cleaner provides protective finish in copper, brass, silver, gold, pewter, nickel, chrome, and stainless steel. Harmless to skin, non-toxic, and non-flammable, polish is available in 4-oz tubes, 2-lb tins and larger quantities for industrial use. *Anton Co.*
Circle No. 37

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WELDER MFG. CO.
MILWAUKEE

WELDING ENGINEERS

MACHINERY BUILDERS

ESTABLISHED
1936

COMMANDO
ROD

No Flux Required

Ideal for Brazing Aluminum and Welding Zinc Base Diecastings. COMMANDO ROD is easy to use with all types of welding equipment. May be applied with regular torch; acetylene and air torches; hydrogen, natural gas or bottled petroleum gases. Flows freely at 715°.

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Select the Correct

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OR ELECTRODES

FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

FUSE-WELL NO. 12

FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

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FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
NORTH CHICAGO, ILLINOIS

QUIK-HEAT

up to 2200° F.

CLEMENTS
Cadillac
MODELS K3 & M2
BLOWTORCHES

Here are rugged, high efficiency blowtorches that speed up all types of heat treating and production operations. These two Clements Cadillac Blowtorches provide heat up to 2200°F. in seconds and are fully portable.

With the Clements Cadillac model K3 or M2 you can bring the torch to the work instead of the work to the torch as in fixed installations. Furnished fully equipped with sturdy, high stability stand. Easily adjustable for height and direction of torch.

Operates on natural, manufactured, or LP-gas.

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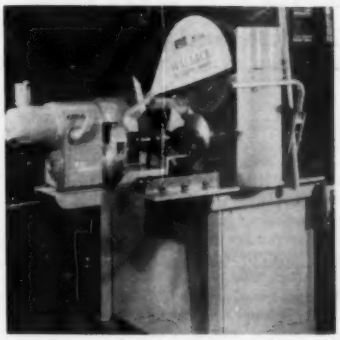

Cutting unit

"Roto trimmer" modular cutting unit for fast, accurate cutting of risers from foundry castings has chuck that rotates as well as the cutting wheel. This lessons the arc of contact, keeping the work cooler as it cuts. Chuck capacity is 9-in. O. D. x ½-in. wall stainless steel rings or 6-in. solids, cutting off the risers with 0.031-in. maximum corner radii of the cut-off surface. A 16-in. abrasive cut-off wheel is used with a 10-hp, 220/440-volt, 3-phase, 60-cycle motor. Dimensions are 60 11/16-in. width; 55-in. depth; 65¾-in. height. Weight is approximately 1,410 lb. *Wallace Supplies Mfg. Co.*

Circle No. 38

Hand cutter

Designed primarily for cutting round openings in tanks and large diameter pipe, mechanized hand cutter makes straight, irregular or circular cuts in flat plate with speed and accuracy, according to maker. A magnetic radius rod permits center fulcrum to rise and fall with the contour of the tank, producing a perfectly round opening. Oxyacetylene torch, powered by a small 110-volt variable speed motor, makes it adaptable to cutting varying thicknesses. Weight is 23 lb. *Steffan Mfg. Corp.*

Circle No. 39

Adapters

Four inert-arc, air-water hose and machine adapters are specially designed to adapt new IAA standard fittings to old-style torches or machines. Fittings are two-piece, silver-soldered units that feature swivel nuts to assure positive, gas-tight sealing. Unit No. 403 adapts 15A to 7; No. 404 adapts AW-15 to AW-7; No. 405 adapts 14A to 32; and No. 406 adapts AW-14 to AW-32. *Western Enterprises, Inc.*

Circle No. 40

Flood Master

FIBER GLASS
HELMETS

Seamless and stoutly reinforced with more comfortable and durable Fit-Rite, snap-on ratchet type headgear.

No. 51-8F-2H

NEW DESIGN
ADVANTAGES

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Free literature

. . . use card on page 103

75. AIR COMPRESSORS—Allis-Chalmers Mfg. Co. Bulletin 16-B9486 gives procedure for operation of firm's standard C style, pedestal-mounted, ball-bearing type compressor.

76. AUTOMATION TOOLS—Buckeye Tools Corp. Low cost approach to automatic drilling, tapping, and fastening operations is subject of an 8-page brochure issued by firm on its new line of linear-motion-plus-rotation tools.

77. NICKEL ALLOY STEELS—International Nickel Co., Inc. Two-section, 27-page booklet serves as guide to steel service centers and products available through them.

78. HARD FACING—Wall Colmonoy Corp. Newsletter describes manufacturer's process for hard facing and silver brazing.

79. WATER CONTROL—Van Vooren Products. Circular describes water flow control for use on welding equipment where condensation is a problem.

80. SPEED REDUCERS—Dodge Mfg. Corp. Modern methods of speed reduction with compact, shaft mounted units in wide range of sizes and horsepowers are described in 64-page bulletin A-692.

81. FACE SHIELDS—American Optical Co. Bulletin illustrates and lists characteristics of line of face shields and accessories.

82. PORTABLE BLOWER—Manhattan Electric & Maintenance Co. Folder gives specifications for waterproof, vaporproof blower for industrial use.

83. TIG WELDING TORCHES—Tec Torch Co., Inc. Folder and leaflets describe and list prices for firm's line of water cooled torches, and related parts, for Tig welding.

84. BACKING-RINGS—Robvon Backing Ring Co. Bulletin 58-2 describes and illustrates various types of backing rings for welding operations.

85. CYLINDER TRUCKS—Harper Trucks, Inc. Form HTM-1 describes and lists specifications for line of company's medical oxygen cylinder trucks.

86. WELDING UNITS—National Cylinder Gas Div., Chemetron Corp. Brochure NH-179 provides information on four models of firm's gasoline engine-powered welding units, which provide a-c or d-c welding current for jobs beyond the power line.

87. DUST MASKS—Watchmoket Optical Co. Folder describes how filter mask provides respiratory protection against mists, sprays and nuisance dusts.

88. FLASH-BUTT WELDING—Taylor-Winfield Corp. Bulletin 7-913 pictures and gives specifications for line of flash-butt welding machines, including type of work piece intended for each.

89. GRINDING WHEELS—The Carborundum Co. Grades, dimensions, and maximum operating speeds for company's line of grinding discs and wheels are listed in 11-page folder.

90. WORK HOLDERS—Wales-Strippit Inc. Flyer briefly describes construction and uses of work holders and clamps.

91. POSITIONERS—Aronson Machine Co. Welding positioners for heavy industry are illustrated and described in brief flysheet.

92. ELECTRODES—Hobart Bros. Co. Comprehensive catalog covers manufacturer's complete line of electrodes, gas welding rod, welding flux and automatic welding wire.

93. ADHESIVES—Narmco Resins & Coatings Co. Condensed catalog covers entire line of adhesives, laminating materials, putties and sandwich core.

94. CONTROL AND TORCH—National Cylinder Gas Div., Chemetron Corp. Revised booklet NH-137 describes firm's Dual Shield welding process, utilizing new control unit and torch, and discusses its advantages in relation to several welding procedures.

95. SILICON STACKS—International Rectifier Corp. Bulletin RN-360 contains detailed discussion, with charts and diagrams, of firm's high voltage silicon rectifiers.

96. IMPACT TESTER—Testing Machines Inc. Brochure 561 illustrates and describes manufacturer's motorized impact tester for metals.

97. PROJECTION WELDERS—Taylor Winfield Corp. Twelve-page brochure 8-413 describes 32 multi-spot and projection resistance welding machines in detail, including end products, type of operation, production rate, specifications, and handling equipment.

98. ALUMINUM ALLOYS—Olin Mathieson Chemical Corp. Guide to selection of aluminum alloys for any product is contained in new booklet offered by company.

99. ABRASIVES—Weldon Roberts Rubber Co. Catalog devotes 16 pages to methods and application data, machine and manual operations, speeds, and listings of textures and sizes of rubber-bonded abrasives.

100. FLOW CONTROLS—Hayes Mfg. Co. Firm's low pressure drop control valves are depicted and diagrammed in folder.

101. MOLDING COMPOUNDS—Devcon Corp. Bulletin D-10 discusses advantages of putty and liquid molding compounds in various industrial applications.

102. TUBE WELDER—Cycl-O-Magic Inc. Automatic welding of stainless steel tubing and fittings is briefly described in folder.

103. ARC WELDER—Westinghouse Electric Corp. Bulletin 26-153 contains illustrations, diagrams, and descriptions of industrial d-c arc welder, including applications, optional equipment and features, and dimensions and weight.

104. ELECTRODES—Arcair Co. New brochure lists different types of electrodes available for use with firm's torches, recommended current settings, and related information.

105. DATA SHEETS—National Cylinder Gas Div., Chemetron Corp. New electrode data sheets contain welding characteristics, recommended current ranges, welding or surfacing procedures, and physical properties of deposited metal.

106. PROTECTIVE CLOTHING—Aljay Mfg. Co. Index sheets illustrate and describe full line of gloves, welding curtains and blankets, and accessories; prices included.

107. WELDER TRANSFORMERS—Taylor-Winfield Corp. New 20-page technical brochure (SP-23) contains precise data on resistance welder transformers including construction techniques, transformer rating and load demand, magnetizing and load transients, application and duty cycle.

108. TUBE BENDING—Wallace Supplies Mfg. Co. Illustrated folder sets forth advantages firm claims for its pipe and tube bending operations.

109. SOLDERING—Anchor Metal Co., Inc. Small booklet provides a summary of the origin and uses of the soldering process throughout the world, contains a special section devoted to soldering of aluminum.

110. PROTECTION EQUIPMENT—Sellstrom Mfg. Co. Twenty-eight-page catalog No. 36 provides firm's complete line of eye and face protection equipment, with each item illustrated.

111. ABRASIVE WHEELS—Bay State Abrasive Products Co. Different models of abrasive wheels and cups are set forth, complete with diagrams, illustrations, and specifications, in firm's 10-page booklet.

112. HOSE REELS—United Specialties, Inc. Automatic reels for hose and cable are described in new catalog folder, including single and dual hose and reel application.

113. WELDER DESIGN—Taylor-Winfield Laboratory bulletin AP-18 consists of actual case histories showing how resistance welders are selected or specially engineered for the needs of particular welded products.

123. ALLOY SPECIFICATIONS—Ampco Metal, Inc. Bulletin 33e contains chemical and physical properties of a series of special aluminum bronze alloys.

124. BLAST CLEANING — Wheelabrator Corp. Bulletin discusses the economic aspects of blast cleaning structural steel prior to use in commercial construction.

125. FILTERS — Aircraft Porous Media, Inc. Bulletin A-1081 tells about filter featuring all stainless steel Rigimesh filter elements for handling liquid or gas capacities up to 43 gpm for service up to 5,000 psi.

126. STEEL CONSTRUCTION—American Steel Institute of Construction, Inc. Booklet discusses modern methods of fire protecting steel-framed buildings.

127. HYDRAULIC SHEARS — Cleveland Crane & Engineering Co. Catalog No. 2030-A illustrates and explains line of Steelweld hydraulic shears with pivoted-blade action.

128. PEENING MACHINE — Perfecto-Peen, Div. of Aero-Test Equipment Co., Inc. Bulletin PPD-109 describes Model A-50 machine for peening, cleaning, and finishing by a process using minute glass beads.

129. SAFETY STARTERS — Westinghouse Electric Corp. Booklet B-7322 tells of six important safety features of new type L combination safety starters.

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WELDING TORCHES, New, Rego GV.
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WELDING EQUIPMENT BOUGHT & SOLD. All Kinds. Submit List and Prices.
RALL SUPPLY CO., 51 E. 42nd St., N.Y.C. 17

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86 Boxes (60 lb. cartons) — 3/16" Race-260-15, AWS-E-12015, Low Hydrogen Welding Rod

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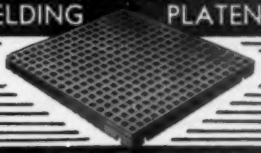

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#2	19½¢ ft.	#4/0	56¢ ft.

5% Discount For Full Reels of 500 ft. and 1000 ft.

We Pay Freight on 300# or More.
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Write for our 1960 Stock Sheet.

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150. Acro Welder Mfg. Co.—Write for further information on welding machinery engineered and manufactured to order.

151. Air Reduction Sales Co.—Further Information available on "Airco" welding and cutting torches, tips and regulators.

152. Alloy Rods Co.—Additional information on Atom-Arc electrodes available.

153. All-State Welding Alloys Co., Inc.—Information on custom coating your welding rods and 54 page instruction manual available.

154. American Brass Co.—Publication B-13 gives detailed and practical information on "Anaconda" welding rods for repair and production jobs.

155. American Optical Co.—Additional information on "Weld-Cool" white fiber glass welding helmets available.

156. American Platinum & Silver Div.—Booklet available, "A Complete Guide to Selective Fluxing for Low Temperature Silver Brazing."

157. Ampco Metal, Inc.—Bulletin W-17 gives detailed facts on the complete Ampco welding line.

159. Atlas Welding Accessories Inc.—Further information on the Atlas "Wide Blade" tomahawk, and other weld cleaning tools.

160. Bateman Foundry & Machine—Information on the "Bantam Iron Worker" and name of your nearest distributor is available.

161. Bausch & Lomb Optical Co.—Further details and prices on Bausch & Lomb chippers and weldors flexible goggles and eyeshields.

162. Bernard Welding Equipment Co.—Write for additional information on Bernards "Shortstub" electrode holder.

163. Black & Decker Mfg. Co.—Circle No. 163 on Info-Aid card to arrange a demonstration of Black & Decker Magnetic Drill Press in your plant.

164. Bridgeport Brass Co.—Information on Bridgeport welding rods available in booklet "Bronze Welding."

165. The Budd Co., Electronic Controls Div.—Further details available on "Monautronic" V-2 welding control for resistance welding.

166. The Budd Co., Instruments Div.—Gamma radiography bulletin available.

167. Cam-Lok Div., Empire Products, Inc.—Bulletin No. 301 on receptacles and plugs available.

168. Chicago Hardware Foundry Co.—Information on "Fuse-Well" cast iron welding rods and electrodes is available.

169. Clements Mfg. Co.—Write for further information on the "Cadillac" blowtorch for all kinds of heat treating and production processes.

170. Coyne Cylinder Co.—Further information available on Coyne Acetylene Cylinders.

171. Contour Sales Corp.—Write for additional information on "Curv-O-Mark" pipe layout tools for marking pipes and structural angle cuts of any type.

172. Duro Engineering Co.—Further information available on "Duro" electrode holders.

173. Epsco, Inc.—Write for further information on Epsco's resistance welder analysis system.

174. Eutectic Welding Alloys Corp.—Further information on "QuenchTrade" welding, the new water cooled welding process, is available.

175. Fibre-Metal Products Co.—Bulletin No. T2-R on "SuperGrip" ground clamps is available.

176. Flood Safety Products Co.—Write for further information on fiber glass helmets and other welding and safety equipment.

177. Galv-Weld Products—Information and distributor franchises on galvanized welding and samples are available.

221. General Cable Corp.—Further information available on welding cable manufactured by General Cable.

178. General Electric Co.—Further information and samples of coaxial ignitron for resistance welding method.

179. Glenn Pacific Power Supply Co.—Information on power supplies for welding processes is available.

180. Goldsmith Bros., Div. of National Lead Co.–Complete data on GB silver brazing alloys is available.

181. Harnischfeger Corp.—Literature available on "P&H" electrodes, welding positioners and industrial welders.

182. Haynes Stellite Co.—Write for further information on Haynes "Hard-Facing Machines."

183. Hobart Brothers Co.—Further information available on Hobart's new versatile automatic welding equipment.

184. Hobart Brothers Co.—Information on the new H-950 Flux for use with hardsurfacing wire and sample available.

185. Independent Engineering Co.—Write for further information on Acetylene Cylinders manufactured by Independent.

186. International Nickel Co.—New brochure available, "Inco-Hard "1" Electrode for Hard-surfacing."

187. Invincible Vacuum Cleaner Mfg. Co.—Send for folder on Invincible Flux Recovery Systems.

188. Jackson Products—Further information available on Jackson's new "Sealed Tight" electrode holders.

189. Lenco, Inc.—Booklet available, "Reducing Costs by Proper Care of Arc-Welding Circuits."

190. Lennox Tool & Machine Builders—Complete information on the "MetlMastr" for shearing, forming and piercing.

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Literature offered in ads . . . continued

191. Linde Co.—Folder F-1313 available on the "Purox" E cutting torch.

192. Linde Co.—Write for further information on the "Oxweld CM-56" shape cutting machine, and the "Photocell Tracer."

222. Linde Co.—Catalog F1372 on the new "Sigmatic" mig welding equipment is available.

193. Manhattan Rubber Div.—Bulletin 7157 on Manhattan abrasive wheels including the "Safety Back Flared Cup."

194. Markal Co.—Literature and sample pellet of "Thermomelt" temperature indicators available.

195. Merrill Brothers—Catalog C-2 on automatic safety lock fork lift attachment and other material handling devices.

196. Miller Electric Mfg. Co., Inc.—Complete specifications on Model SR-1000, three phase transformer with sealed semi-metallic rectifiers and the Miller welder/power plant available.

197. National Carbide Co.—Write for more data on "more gas per pound" features of calcium carbide.

198. Norton Company—Further information on grinding wheels manufactured by Norton available.

199. Page Steel & Wire Div.—Folders containing information on submerged arc and inert gas automatic welding wire is available.

200. Picker X-Ray Corp.—Write for further information on the "Portaflux" and "Ferroflux" for non-destructive inspection equipment.

201. Pressed Steel Tank Co.—Prices and specifications on Hackney cylinders for compressed industrial gases.

202. J. M. Ragle Industries, Inc.—Further data available on "Commando" rods, and other "Commando" products.

203. Ransome Company—Write for further information on Ransome welding positioners.

204. Riegel Textile Corp.—Catalog on the complete line of welding gloves available.

205. Robvon Backing Ring Co.—Additional data available on backing rings manufactured by Robvon.

206. Shoot-A-Lite Corp.—Literature on "Safety Gas Liter" for welding and cutting torches.

207. Stoody Co.—Write for details on a demonstration of the Stoody semi-automatic welder and hard-facing wires.

208. Sylvania Electric Products Inc.—Further information available on Tungsten electrodes manufactured by Sylvania for "TIG" welding.

209. Syntron Rectifier Div.—Information and specifications available on Syntron selenium welding stacks.

210. Tempil Corp.—Sample Tempil pellets available and information on Tempilsticks.

211. Thermacote Co.—Data available on Thermo filter plates and cover lenses.

212. John Tillman & Co.—Further information available on Tillman gloves for welders.

213. Tuffaloy Dept.—Catalog and price list on Tuffaloy cold-formed resistance welding tips.

214. Vee-Arc Corp.—Further data on 2-hp portable grinders is available.

215. Vickers, Inc.—Bulletin EPD 7116-1 on "The Vickers Controlarc DC Welder," available.

216. Victor Equipment Co.—Further information available on Victor's cutting torches.

217. Wall Colmonoy Corp.—Write for the new Model D Spraywelder catalog and price list.

218. Webb Corp.—Illustrated literature on tank production machinery manufactured by Webb.

219. Westinghouse Electric Corp.—More information on the new WS silcon welder available.

220. Wilton Tool Mfg. Co.—Catalog available on C-clamps.

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WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

★ Post card not valid after three (3) months. After that, write *directly to the manufacturer*, describing fully the information and/or literature wanted.

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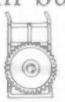
Anaconda Memo to Management

This is a penny's worth of bronze

It's a piece of Anaconda welding rod that could be worth its weight in gold to you. It might save you a big capital investment or important production time by salvaging equipment that seems beyond repair. Take the experience of Jessup Steel Co., for example. A while back their production stopped dead in its tracks when the 60-ton semisteel base of a big forging hammer fractured. A replacement base? Of course—in nine months. Jessup called specialists in repairing heavy machinery. The base was repaired by braze welding in a week —at 20% of replacement cost. About a ton of Tobin Bronze®-481 rod was used. But sometimes a few ounces can make equally significant savings in building up worn surfaces or repairing a broken part that has immobilized  a big machine. *And don't overlook braze welding in production.* It's a practical way to get flexible, low-cost production assembly of tubular and sheet steel products —like furniture and appliances. American Motors uses it to add strength, prevent squeaks, leaks, and rattles in unit construction of the Rambler's body, supplementing electric welding in some 30 areas. Anaconda-997 (Low Fuming) Bronze Rod has proved to be the best welding rod for these production uses.

6080

We'd be glad to send you (or anyone else in your company) a copy of Publication B-13 which gives detailed and practical information on Anaconda Welding Rods in repair and production jobs. If you have a special problem, the services of an Anaconda specialist are at your disposal. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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